

IN THE UNITED STATES DISTRICT
COURT WESTERN DIVISION FOR THE
NORTHERN DISTRICT OF OHIO

Renz, et. al,
Plaintiff
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&

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-VS-

State of Ohio, et. al

Defendant(s)

CASE NO. 3:20-cv-1948

JUDGE: Honorable Judge
James Carr

**EXHIBIT – Attachment A:
Discussion of COVID-19
Deaths and Disease
Comparison**

The following has been submitted by Plaintiff's attorney, Thomas Renz.

Respectfully submitted,

s/ Thomas Renz

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Attachment A

Discussion of COVID-19 Deaths in the United States

From February 1, 2020 through March 21, 2020 the CDC reported a total of 665 COVID-19 deaths (CDC Daily Updates of Totals by Week and State, 2020). The following week ending March 28 there were a staggering 3,146 COVID-19 deaths reported. It begs the question; how does the death count increase by nearly five times in one week, which is more than that of the previous seven weeks combined? Concerns over inflated COVID-19 fatality numbers have been prominent for months. Businesses are being shuttered because of these numbers. Paychecks are being furloughed because of these numbers. Children are being denied the opportunity to go to school because of these numbers. Masks are being mandated because of these numbers. So, are they right?

INFECTIOUS DISEASE REPORTING AND CAUSES OF DEATH

Before COVID-19

For the past 17 years, all infectious diseases and causes of death are categorized based on the guidance of the 2003 CDC's *Medical Examiners' & Coroners' Handbook on Death Registration and Fetal Death Reporting* and the CDC's *Physicians' Handbook on Medical Certification of Death*. "The cause-of-death section consists of two parts. Part I is for reporting a chain of events leading directly to death, with the immediate cause of death (the final disease, injury, or complication directly causing death) online (a) and the underlying cause of death (the disease or injury that initiated the chain of events that led directly and inevitably to death) on the lowest used line. Part II is for reporting all other significant diseases, conditions, or injuries that contributed to death but which did not result in the underlying cause of death given in Part I." (Centers for Disease Control and Prevention, 2003).

Unique COVID-19 Reporting and the Impact of Comorbidities on Fatality Data

On March 24, 2020 the National Vital Statistics System (NVSS) released the formal guidance regarding a "newly-introduced ICD code" (U07.1) to "accurately capture mortality data for Coronavirus Disease 2019 (COVID-19) on death certificates" (CDC, 2020e). These guidelines usurped the 2003 data collection guidance that is used for all other infectious diseases and causes of death data and are unique to COVID-19.

Also guiding COVID-19 data collection and reporting is the April 14th CDC adoption of a position paper authored by the Council of State and Territorial Epidemiologist (CSTE position paper). The NVSS guidelines and the CSTE position paper provide that COVID-19 would:

- be recorded as the underlying cause of death "more often than not;"
- be recorded as the cause of death listed in Part I of the death certification even in assumed cases;
- be recorded as the primary cause of death even if the decedent had other chronic comorbidities. All comorbidities for COVID-19 would be listed now in Part II, rather than in Part I as they have been since 2003 for all other causes of death.

It is the Part I causes of death that are recorded for public health reporting. Also within these guidelines the instructions were clear to report the cause of death as COVID-19 even without a

confirmed test. “COVID-19 should be reported on the death certificate for all descendants where the disease caused **or is assumed to have caused or contributed to death**. Certifiers should include as much detail as possible based on their knowledge of the case, medical records, laboratory testing, etc.” The guidelines also state, “If the death certification reports terms such as “probable COVID-19” or “likely COVID-19,” these terms would be assigned the new ICD code. It is **not likely that the NCHS will follow up on these cases.**” (National Vital Statistics System, 2020).

The CSTE position paper assists individuals in determining whether a person has possible or probable COVID-19. The criteria for a diagnosis are quoted below:

COVID-19 Death Certificate Guidelines

Clinical Criteria

At least two of the following symptoms: fever (measured or subjective), chills, rigors, myalgia, headache, sore throat, new olfactory and taste disorder(s)

OR

At least one of the following symptoms: cough, shortness of breath, or difficulty breathing

OR

Severe respiratory illness with at least one of the following:

- Clinical or radiographic evidence of pneumonia, OR
- Acute respiratory distress syndrome (ARDS).

AND

No alternative more likely diagnosis.

Laboratory Criteria

Laboratory evidence using a method approved or authorized by the U.S. Food and Drug Administration (FDA) or designated authority:

Confirmatory laboratory evidence:

- Detection of severe acute respiratory syndrome coronavirus 2 ribonucleic acid (SARS-CoV-2 RNA) in a clinical specimen using a molecular amplification detection test

Presumptive laboratory evidence:

- Detection of specific antigen in a clinical specimen
- Detection of specific antibody in serum, plasma, or whole blood indicative of a new or recent infection*

**Serologic methods for diagnosis are currently being defined.*

Epidemiologic Linkage

One or more of the following exposures in the 14 days before onset of symptoms:

- Close contact** with a confirmed or probable case of COVID-19 disease; **OR**
- Close contact** with a person with:
 - clinically compatible illness **AND**
 - linkage to a confirmed case of COVID-19 disease.
- Travel to or residence in an area with sustained, ongoing community transmission of SARS-CoV-2.
- Member of a risk cohort as defined by public health authorities during an outbreak.

***Close contact is defined as being within 6 feet for at least a period of 10 minutes to 30 minutes or more depending upon the exposure. In healthcare settings, this may be defined as exposures of greater than a few minutes or more. Data are insufficient to precisely define the duration of exposure that constitutes prolonged exposure and thus a close contact.*

Case Classification

Probable

- Meets clinical criteria **AND** epidemiologic evidence with no confirmatory laboratory testing performed for COVID-19.
- Meets presumptive laboratory evidence **AND** either clinical criteria **OR** epidemiologic evidence.
- Meets vital records criteria with no confirmatory laboratory testing performed for COVID-19.

Confirmed

- Meets confirmatory laboratory evidence.

Other Criteria

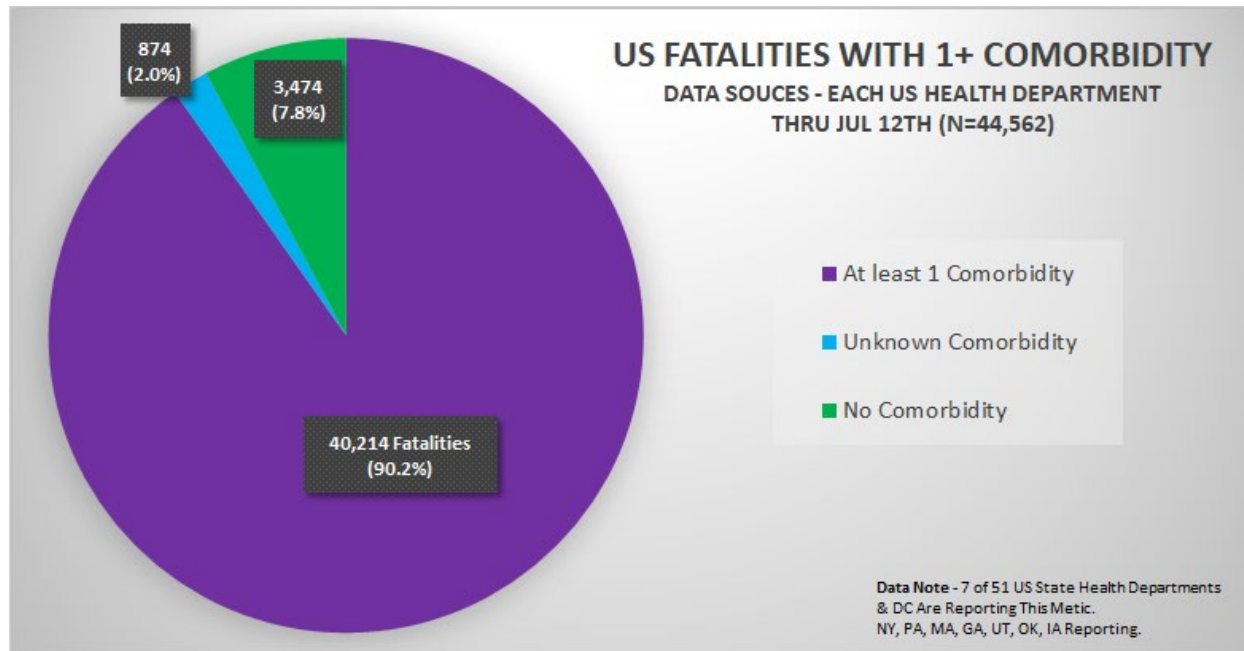
Vital Records Criteria

- A death certificate that lists COVID-19 disease or SARS-CoV-2 as a cause of death or a significant condition contributing to death.

Within the 2003 CDC Handbook guidelines COVID-19—in the presence of an established comorbidity—could be no higher than Part I, line item (d) or lower, or in Part II. To simplify, under the 2003 CDC handbook, COVID-19 fatalities would be listed as a cause of death in Part I only if there were no comorbidities. Furthermore, COVID-19 would have only been permitted to be listed on a death certificate if there had been a positive lab test or confirmation through pathologic autopsy findings.

“If each state were publishing comorbidity data, and if each state used the CDC’s 2003 Revision Handbook as they do for all other death certificates, **the actual COVID-19 fatality totals would be approximately 90.2% LOWER than they currently are based upon an extrapolation of the data that is available.**” (Children’s Health Defense, 2020).

The same article discussed the compiled data from the only seven states that publish analyzable comorbidity data. The researchers found "... that 90.2% of the state fatalities had at least one comorbidity and therefore these fatalities would not be counted as COVID-19 fatalities under the 2003 CDC Handbook, but instead are counted based on upon the NVSS guidelines and CSTE position paper adopted by the CDC on March 24th and April 14th respectively." Below is comorbidity graph presented by Children's Health Defense researchers.



Source: Children's Health Defense, 2020

In April 2020, the Journal of the American Medical Association published a study and reported that 94% of COVID-19 patients in the New York City area suffered from at least one comorbidity (Richardson et al., 2020). The researchers found that 53% of all COVID-19 patients also had hypertension, 42% were categorized as obese, and 32% had diabetes. Karina Davidson, one of the study's authors, stated, "Having serious comorbidities increases your risk. This is a very serious disease with a very poor outcome for those who have severe infections from it."

Comorbidities Kill Millions Each Year

Below is a chart of the top causes of death for the 2018 year, the most recent data available (CDC, 2020a).

Underlying Cause of Death, 1999-2018 Results

Request Form	Results	Map	Chart	About
Dataset Documentation	Other Data Access	Help for Results	Printing Tips	Help with Exports
Save	Export	Reset		
Quick Options	More Options	Top	Notes	Citation
Query	Criteria			

15 Leading Causes of Death ↓			
	Deaths ↑↓	Population ↑↓	Crude Rate Per 100,000 ↑↓
#Diseases of heart (I00-I09,I11,I13,I20-I51)	655,381	327,167,434	200.3
#Malignant neoplasms (C00-C97)	599,274	327,167,434	183.2
#Accidents (unintentional injuries) (V01-X59,V85-V86)	167,127	327,167,434	51.1
#Chronic lower respiratory diseases (J40-J47)	159,486	327,167,434	48.7
#Cerebrovascular diseases (I60-I69)	147,810	327,167,434	45.2
#Alzheimer disease (G30)	122,019	327,167,434	37.3
#Diabetes mellitus (E10-E14)	84,946	327,167,434	26.0
#Influenza and pneumonia (J09-J18)	59,120	327,167,434	18.1
#Nephritis, nephrotic syndrome and nephrosis (N00-N07,N17-N19,N25-N27)	51,386	327,167,434	15.7
#Intentional self-harm (suicide) (*U03,X60-X84,Y87.0)	48,344	327,167,434	14.8
#Chronic liver disease and cirrhosis (K70,K73-K74)	42,838	327,167,434	13.1
#Septicemia (A40-A41)	40,718	327,167,434	12.4
#Essential hypertension and hypertensive renal disease (I10,I12,I15)	35,835	327,167,434	11.0
#Parkinson disease (G20-G21)	33,829	327,167,434	10.3
#Pneumonitis due to solids and liquids (J69)	19,239	327,167,434	5.9

Note: A '#' symbol preceding the label indicates a rankable cause of death. [More information.](#)

Source: <https://wonder.cdc.gov/controller/datarequest/D76jsessionid=77882FF4BD5D3BE7ADC461287433BE6F>

At the top of the list is diseases of the heart: 655,381 individuals died of heart conditions in 2018. Certainly, heart conditions would be a pre-existing condition. What if an individual has COVID-19 and a heart disease and they die, are they going to list it as a COVID-19 death?

Four rows down we see an extremely significant number: 159,000 individuals died from chronic lower respiratory disease in 2018. Diabetes killed nearly 85,000 individuals and 59,120 deaths were caused by influenza and pneumonia. These numbers illustrate the people who have comorbidities with COVID-19.

If we extrapolate those numbers to 2020, that's nearly one million people with comorbidities. According to Statistician Professor Sir David Spiegelhalter, there will be "a substantial overlap" with COVID-19 and "Many people who die of [COVID-19] would have died anyway within a short period." (Triggle, N., 2020).

The CDC Morbidity and Mortality Weekly Report for February 12–March 28, 2020 also reported that 94% of COVID-19 patients had at least one underlying condition (comorbidity) (CDC, 2020f). Given these massive cause of death numbers, the guidelines for listing cause of death is *critical* in separating out the comorbid vs. the COVID-19 deaths. Unfortunately, given the guidelines discussed, it can be anticipated that a majority of these deaths will be/have been attributed to COVID-19, thus leading to inflated numbers and inaccurate data on which important decisions are being made—even Supreme Court decisions.

In May, in an opinion discussing large gatherings, Chief Justice Roberts mentions that COVID-19 "has killed thousands of people in California and more than 100,000 nationwide." (S. Bay United Pentecostal Church v. Newsom, 2020). What if, just like in New York, 94% of those 100,000 had co-morbidities that were the actual cause of death. What if 94,000 of those deaths were individuals who died *with* COVID-19, not *from* COVID-19? Even if that is the case for half of them, ignoring the way these statistics have been recorded for the past 17 years and changing it has disastrous implications.

In actuality the COVID-19 death rate could be more like to the severe seasonal flu which are between 12,000 – 61,000 deaths annually, per CDC estimates. (CDC, 2020c). Not the hundreds of thousands which Chief Justice Roberts was lead to believe.

In an editorial in New England Journal of Medicine, Fauci et al. (2020) stated that “If one assumes that the number of asymptomatic or minimally symptomatic cases is several times as high as the number of reported cases, the case fatality rate may be considerably less than 1%. This suggests that the overall clinical consequences of Covid-19 may ultimately be more akin to those of a severe seasonal influenza (which has a case fatality rate of approximately 0.1%) or a pandemic influenza (similar to those in 1957 and 1968) rather than a disease similar to SARS or MERS, which have had case fatality rates of 9 to 10% and 36%, respectively.”

FINANCIAL INCENTIVE FOR FALSE REPORTING

Section 3710 of the CARES (Coronavirus Aid, Relief, and Economic Security) Act increased the amount of payment to hospitals from Medicare by 20% for patients being treated with COVID-19. While there is much discussion on what is actually covered in the treatment of COVID-19 by this Act, the simple fact is that hospitals make 20% more from a COVID-19 patient suffering from acute respiratory distress syndrome or pneumonia than an influenza patient with the same issues. Given the criteria that no testing is required to list COVID-19 as a cause of death there would appear to be a substantial incentive to use a COVID-19 diagnosis whenever possible to obtain the higher reimbursement rate.

MORE EXPERTS EXPRESS CONCERN THAT NUMBERS ARE OVER-INFLATED

Recently, some of the prominent U.S. public health leadership have also speculated on the financial incentive for hospitals classifying deaths as COVID-19. The CDC’s director, Robert Redfield, stated that financial incentives could inflate COVID-19 fatality totals (Satney, 2020).

“I think you’re correct in that we’ve seen this in other disease processes too, really in the HIV epidemic, somebody may have a heart attack, but also have HIV — the hospital would prefer the [classification] for HIV because there’s greater reimbursement.

So I do think there’s some reality to that. When it comes to death reporting, though, ultimately, it’s how the physician defines it in the death certificate and ... we review all of those death certificates.

So I think, probably it is less operable in the cause of death, although I won’t say there are not some cases. I do think though [that] when it comes to hospital reimbursement issues or individuals that get discharged, there could be some play in that for sure.”

This sentiment is also shared by the U.S. Health and Human Services Admiral Giroir who stated that he “acknowledged that the statistics he is getting from the states are over-inflated.” (Satney, 2020).

Additionally, in early May Dr. Deborah Birx, coronavirus task force member, expressed concerns with the possible inflation of COVID-19 fatalities and case counts, stating, “There is nothing from the CDC that I can trust.” According to four people present for a discussion between Dr. Birx and Robert Redfield, Dr. Birx expressed her belief that the death toll may be inflated by up to 25% (Dawsey et al., 2020).

Many states including Colorado, Pennsylvania, and New Jersey face questions concerning COVID-19 patients dying from causes other than the virus. In late April, Pennsylvania removed more than 200 deaths from their COVID-19 reporting. The president of the Pennsylvania Coroners Association and practicing coroner commented that “There’s a discrepancy in the numbers. I’m not saying there’s something going on... I’m not a conspiracy theory guy. But accuracy is important.” (Simon, 2020).

In early May, it was reported that nearly 24% of individuals counted as a COVID-19 fatality in the state of Colorado do not have COVID-19 listed on their death certificate (Ingold and Paul, 2020). And again in May, the San Diego County California supervisor argued that there were only six COVID-19 deaths within the county’s 194 count, that were “pure, solely coronavirus deaths.” (Miller, 2020).

Another example, the Washington State health statistics manager, Dr. Katie Hutchison, confirmed that non-COVID-19 deaths were being recorded at COVID-19 deaths, “We currently do have some deaths that are being reported that are clearly from other causes... We have about five deaths – less than five deaths – that we know of that are related to obvious other cases. In this case, they are from gunshot wounds.” (Duduit, 2020).

EXCESS DEATHS AND THE IMPACT OF COVID-19 MITIGATION/RESPONSE

The COVID-19 mitigation efforts were not aimed at lowering overall suffering and death but instead were blindly focused on “stopping the virus”. There was no clear cost-benefit analysis conducted or presented which would have considered two critical positions: whether the mitigation would work and whether the cost of it working would create more harm, at which point other options should have been considered. As Kristina Kristen (2020), guest editor for the Children’s Health Defense, stated, “If a so-called solution “works” but in doing so creates massive, disproportionate collateral damage and increases overall harm, then clearly it cannot be called a solution, and certainly should never be mandated onto a population.”

One example of a COVID-19 response that had catastrophic impact was that of the mismanagement of nursing homes. In mid-March, several governors issued orders to require COVID-19 patient placement in nursing homes thus exposing the most vulnerable population. On March 25, 2020 New York Governor Andrew Cuomo prohibited nursing homes from requiring incoming patients to be tested for COVID-19 or to inquire as to their COVID-19 status (New York Department of Health, 2020). Five governors (MI, NY, PA, NJ, and CA) ignored protocols and forced COVID-19 patients into nursing homes (Scalise Congress of the United States letter, 2020). Republican Whip Steve Scalise, the Ranking Member of the Select Subcommittee on the Coronavirus Crisis, wrote, “While nursing home residents make up 0.5% of the U.S. population, they account for 42% of nationwide COVID-19 deaths.” These nursing

home deaths were predictable and preventable and come at the hands of governors making poor COVID-19 mitigation policy decisions.

Excess deaths are calculated based on an estimate of how many people are expected to die during any given time period (CDC, 2020d). It goes without saying that no one can predict how many people will die at any given time and that many things impact this number. According to the CDC (2020d), as of August 21, 2020 the total number of deaths involving COVID-19 (which includes all deaths where COVID-19 was present even when it was not the cause of death) was 159,865. The total number of deaths from all causes was 1,737,141 and the percent of expected deaths was 111%. Basic math tells us the following:

- If 1,737,141 is 111% of expected deaths, then the total expected deaths would be 1,564,991.891891
- Given this it can be concluded that there are approximately 172,150 excess deaths as of August 21, 2020
- The difference between the expected deaths and deaths attributed to COVID-19 are the basis for the argument that there is undercounting.

As clearly demonstrated in the sections above, the number of deaths from COVID-19 is nowhere near the number presented by the CDC, so how can we be experiencing so many excess deaths if they are not coming from COVID-19?

When discussing excess deaths, the damage being done by the COVID-19 mitigation efforts must be taken into consideration. The reality is that the true danger to Ohioans and the U.S. public stems not from COVID-19, but from the so-called solution to COVID-19 which has created "...massive, disproportionate collateral damage..." and has increased "overall harm." (Kristen, 2020). An overview of some of the mitigation impacts are presented below.

Nursing Home Catastrophe:

- On March 25, 2020, Governor Andrew Cuomo issued an order prohibiting nursing homes from requiring incoming patients to be tested for COVID-19 or to inquire as to their COVID-19 status.

No resident shall be denied re-admission or admission to the NH solely based on a confirmed or suspected diagnosis of COVID-19. NHs are prohibited from requiring a hospitalized resident who is determined medically stable to be tested for COVID-19 prior to admission or readmission.

https://web.archive.org/web/20200407103413/https://coronavirus.health.ny.gov/system/files/documents/2020/03/doh_covid19-_nhadmissionsreadmissions_-032520.pdf

- In a May 1, 2020 opinion article, *Blame governors for the coronavirus deaths in nursing homes*, Michael Goodwin wrote,

"If they are honest, historians judging the American experience during the coronavirus pandemic will excoriate our barbaric failure to protect the elderly. We think ourselves as civilized, but mindless policies and bureaucratic indifference turned many nursing homes and

rehabilitation centers into killing fields.” <https://nypost.com/2020/05/16/blame-governors-for-coronavirus-deaths-in-nursing-homes-goodwin/>

- A June 2020 Special Report, *Infection Control Surveys at Nursing Facilities: CMS Data are Not Plausible*, from the Center for Medicare Advocacy and an article, *Nursing homes go unchecked as fatalities mount*, discussed how nearly half of the U.S. nursing homes failed to follow standard oversight during COVID-19 which would undoubtedly impact the number of unnecessary and preventable deaths of the most at risk population.

Thousands of nursing homes across the country have not been checked to see if staff are following proper procedures to prevent coronavirus transmission...

Only a little more than half of the nation’s nursing homes had received inspections according to data released earlier this month... <https://www.politico.com/news/2020/06/15/nursing-homes-coronavirus-321220> and Center for Medicare Advocacy report <https://medicareadvocacy.org/wp-content/uploads/2020/06/Infection-Control-Surveys-Report.pdf>

- In an article published on August 13, 2020, *More than 40% of U.S. Coronavirus deaths are linked to Nursing Homes*, there were 68,000 residents and workers in long-term care facilities that had died from COVID-19 and of the seven states with the top COVID-19 mortality, five of them are the states that mismanaged nursing homes.

While 8 percent of the country’s cases have occurred in long-term care facilities, deaths related to Covid-19 in these facilities account for more than 41 percent of the country’s pandemic fatalities.

<https://www.nytimes.com/interactive/2020/us/coronavirus-nursing-homes.html>

Deaths of Despair, Suicide, Overdose, Violence, and Health Impacts:

- An April 15, 2020, article, *Officials worry of potential spike in overdose deaths amid COVID-19 pandemic*, discussed the expected spike in drug overdose deaths amid the COVID-19 mitigation efforts.

With millions of Americans forced into weeks of extended isolation, several communities have reported a spike in drug overdose deaths, prompting health officials to raise concerns about the safety of those suffering from substance use disorders amid the COVID-19 pandemic. <https://abcnews.go.com/US/officials-worry-potential-spike-overdose-deaths-amid-covid/story?id=70149746>

- The article, *Projected Deaths of Despair from COVID-19*, published on May 8, 2020 by the Wellbeing Trust, discusses the estimated 75,000 “deaths of despair.” CBS news also published an article discussing the Wellbeing Trust report and “deaths of despair.”

More Americans could lose their lives to deaths of despair, deaths due to drug, alcohol, and suicide, if we do not do something immediately. Deaths of despair have been on the rise for

the last decade, and in the context of COVID-19, deaths of despair should be seen as the epidemic within the pandemic.

... conditions stemming from the novel coronavirus — rampant unemployment, isolation and an uncertain future — could lead to 75,000 deaths from drug or alcohol abuse and suicide, new research suggests.

Deaths from these causes are known as "deaths of despair." And the COVID-19 pandemic may be accelerating conditions that lead to such deaths. https://wellbeingtrust.org/wp-content/uploads/2020/05/WBT_Deaths-of-Despair_COVID-19-FINAL-FINAL.pdf and <https://www.cbsnews.com/news/coronavirus-deaths-suicides-drugs-alcohol-pandemic-75000>

- On May 12, 2020, the Lancet published an article, *A wake-up call: COVID-19 and its impact on children's health and wellbeing*, discussing the expected 1-2 million child deaths and 56,700 maternal deaths in 188 countries as a result of the mitigation efforts if efforts are not taken.

Building on lessons learned from previous outbreaks of Ebola virus disease and severe acute respiratory syndrome (SARS), the authors estimate a devastating increase in the numbers of maternal and child deaths resulting from reductions in routine health service coverage.

Left unchecked, these reductions (due to, for example, disruptions in medical supply chains or the availability of human and financial resources) along with declines in the uptake of health services by communities fearful of infection will be more catastrophic for mothers and children than COVID-19 itself. The projection of an additional 1·2 million child deaths and 56700 maternal deaths in 118 countries if coverage of essential services drops by around 45% for 6 months is alarming. It is also avoidable if we act now.

[https://www.thelancet.com/pdfs/journals/langlo/PIIS2214-109X\(20\)30238-2.pdf](https://www.thelancet.com/pdfs/journals/langlo/PIIS2214-109X(20)30238-2.pdf)

- Another article, *California doctors say they've seen more deaths from suicide than coronavirus since lockdowns*, published on May 21, 2020 explores the impacts the COVID-19 mitigation has had on suicide.

Doctors in Northern California say they have seen more deaths from suicide than they've seen from the coronavirus during the pandemic.

"The numbers are unprecedented," Dr. Michael deBoisblanc of John Muir Medical Center in Walnut Creek, California, told ABC 7 News about the increase of deaths by suicide, adding that he's seen a "years' worth of suicides" in the last four weeks alone.

DeBoisblanc said he believes it's time for California officials to end the stay-at-home order and let people back out into their communities.

"Personally, I think it's time," he said. "I think, originally, this was put in place to flatten the curve and to make sure hospitals have the resources to take care of COVID patients. We have the current resources to do that, and our other community health is suffering."

<https://www.washingtonexaminer.com/news/california-doctors-say-theyve-seen-more-deaths-from-suicide-than-coronavirus-since-lockdowns>

- A letter sent from 600 physicians on May 22, 2020 to President Trump stated that the lockdowns are a ‘Mass Casualty Incident’ and discussed the estimated this mitigation impacts on suicide, cancer, heart attacks, etc.

“The downstream health effects...are being massively under-estimated and under-reported. This is an order of magnitude error,” according to the letter initiated by Simone Gold, M.D., an emergency medicine specialist in Los Angeles.

“Suicide hotline phone calls have increased 600%,” the letter said. Other silent casualties: “150,000 Americans per month who would have had new cancer detected through routine screening.”

From missed cancer diagnoses to untreated heart attacks and strokes to increased risks of suicides, “We are alarmed at what appears to be a lack of consideration for the future health of our patients.” <https://www.forbes.com/sites/gracemarieturner/2020/05/22/600-physicians-say-lockdowns-are-a-mass-casualty-incident/#33715bc350fa>; letter <https://www.scribd.com/document/462319362/A-Doctor-a-Day-Letter-Signed>

- On June 17, 2020, Everytown Research and Policy published an article, *Gun Violence and COVID-19: Colliding Public Health Crises*, the relationship between increased firearm purchasing, during COVID-19 mitigation, and the higher risks of suicide, homicide, unintentional shoots, and intimate partner violence.

The US has seen the collision of two major public health crises: COVID-19 and gun violence. A comprehensive understanding of how this collision will affect Americans and the factors driving the increase in gun violence during the pandemic is still developing, but there are a few takeaways: While millions of Americans rushed out to purchase new firearms in the middle of a global pandemic, thinking they were buying safety, research shows that they are in fact exposing themselves and their families to higher risks of suicide, homicide, unintentional shootings, and intimate partner violence.

<https://everytownresearch.org/reports/covid-gun-violence/>

- On July 15 and 16, 2020, two articles were published, *In Shadow of Pandemic, U.S. Drug Overdose Deaths Resurge to Record* and *Why are overdose deaths surging amid COVID-19?*, discussing the increased drug deaths linked to the COVID-19 mitigation.

Drug deaths in America, which fell for the first time in 25 years in 2018, rose to record numbers in 2019 and are continuing to climb, a resurgence that is being complicated and perhaps worsened by the coronavirus pandemic.

<https://www.nytimes.com/interactive/2020/07/15/upshot/drug-overdose-deaths.html?referringSource=articleShare&fbclid=IwAR10SY-qZCiwKY3W1b0K8SM8nG1fHNRA19cYCeXB94hdTalLglclFMCjHsc>

As the global COVID-19 pandemic continues, opioid overdose deaths are surging nationwide.

This increase in opioid overdose deaths is likely linked to COVID-19 restrictions and closures that have hindered access to treatment and recovery services for those suffering from substance use disorder.

The American Medical Association issued a report stating that it's "greatly concerned by an increasing number of reports from national, state and local media suggesting increases in opioid-related mortality—particularly from illicitly manufactured fentanyl and fentanyl analogs." , <https://wexnermedical.osu.edu/blog/why-are-overdose-deaths-surging-amid-covid-19>

- An article published on July 22, 2020, *Highway deaths spike for third-straight month as drivers take advantage of empty roads*, discusses the surge in motor-vehicle crashes and how the COVID-19 mitigation efforts has supported the "surge" of fatalities.

Motor vehicle fatalities surged by 23.5 percent in May, as drivers took advantage of open roads to push to autobahn speeds, a situation made easier by the fact that authorities in many communities were pulling back on enforcement, in part, to avoid risking the possibility of their officers becoming exposed to the coronavirus.

According to the National Safety Council report, the May numbers mark the third-straight month that U.S. motorists were at a higher risk of dying from a crash — and it comes as a setback to safety advocates who had been hoping that the drop in traffic during the coronavirus-induced lockdown would see a decline in highway fatalities.

"At a moment when the country should be reaping a safety benefit from less traffic, the roads are riskier, threatening to reverse traffic safety gains made over the last few years," the NSC said in a statement. <https://www.nbcnews.com/business/autos/highway-deaths-spike-third-straight-month-drivers-take-advantage-empty-n1234651>

- Robert Redfield, CDC director, also acknowledges the COVID-19 impacts. In an article published on July 28, 2020, *CDC Director Compares Rate of Suicide to COVID-19 Deaths*, Director Redfield is quoted discussing the impacts on high school suicide.

Robert Redfield, Centers for Disease Control and Prevention director, stated, "But there has been another cost that we've seen, particularly in high schools... We're seeing, sadly, far greater suicides now than we are deaths from COVID. We're seeing far greater deaths from drug overdose that are above excess that we had as background than we are seeing the deaths from COVID." <https://townhall.com/tipsheet/micaelaburrow/2020/07/28/redfield-says-more-abovebase-suicides-than-covid-deaths-n2573278>

Children and Adolescents

- The April 15, 2020 *Policy Brief: The Impact of COVID-19 on children*, discussing the “hundreds of thousands of additional child deaths” that could occur in 2020 as a result of the COVID-19 mitigation’s impacts on the economy.

Economic hardship experienced by families as a result of the global economic downturn could result in hundreds of thousands of additional child deaths in 2020, reversing the last 2 to 3 years of progress in reducing infant mortality within a single year. And this alarming figure does not even take into account services disrupted due to the crisis – it only reflects the current relationship between economies and mortality, so is likely an under-estimate of the impact. Rising Executive Summary 2 POLICY BRIEF: THE IMPACT OF COVID-19 ON CHILDREN POLICY BRIEF: THE IMPACT OF COVID-19 ON CHILDREN 3 malnutrition is expected as 368.5 million children across 143 countries who normally rely on school meals for a reliable source of daily nutrition must now look to other sources. The risks to child mental health and well being are also considerable. Refugee and internally displaced children as well as those living in detention and situations of active conflict are especially vulnerable.

https://www.un.org/sites/un2.un.org/files/policy_brief_on_covid_impact_on_children_16_april_2020.pdf

Also, worth mentioning, while not causally related to the COVID-19 mitigation, is that during all of this, on May 25, 2020, George Floyd was arrested and died because of the excessive police force used during the arrest. Following the death and subsequent release of the arrest video, the Nation experienced an increase in rioting, movements to defund the police, protesting, and violence. Additionally, there has also been an increase in homicide deaths (Pries, 2020)

Lastly, according to the CDC (2020d) excess deaths data by date, the increase in excess deaths began immediately following the COVID-19 mitigation/response efforts.

CONCLUSION

Had the 2003 CDC Handbook guidelines been used for recording COVID-19 fatalities, as it has for ALL other causes of death in 2020, the COVID-19 fatality count would be significantly lower. Based on the comorbidity data published by New York, Massachusetts, Georgia, Oklahoma, Utah, Pennsylvania, and Iowa the COVID-19 fatality rate could drop by approximately 90.2%. Additionally, because of the inaccuracies with the available information it is not clear exactly how many people have died as a direct cause of COVID-19. It is clear that large number of the reported COVID-19 deaths may not have correlated to COVID-19 at all. Instead, it appears that most of these individuals only died **with** COVID-19 but not **from** COVID-19. Lastly, the COVID-19 mitigation such as isolation, social distancing, and masks, etc. are proving to be far deadlier and damaging than the virus. The long-term effects of the mitigation have yet to be fully revealed but as we continue to see suicides, “deaths of despair”, overdose, etc. increase it can be assumed that the effects will be devastating and last longer than the virus itself.

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COVID-19 Fatality and Reproduction Rate

On March 22, 2020 Amy Acton, the Ohio Department of Health issued the order that shut down Ohio and placed all citizens into house arrest (the “shelter in place” order) without due process.

Below is a breakdown of some vital statistics related to this order:

Disease	Case Fatality Rate	Reproduction Rate
COVID-19 (Current)	0.26%	0.87 - 2.5 (Ohio specific) 0.7 - 1.9 (Globally)
MERS (2012)	34.3%	2-5
SARS-CoV (2002)	9.6%	2-5
2017-2018 Seasonal Flu	0.14%	1.53
Ebola (2014)	25%	1.51
1957-1960 Flu Pandemic	0.28%	1.65
1918-1920 Flu Pandemic	2.25%	1.8
Tuberculosis	12.3%	0.24 - 4.3

Case fatality rate: The case-fatality rate is the proportion of persons with a particular condition (cases) who die from that condition. It is a measure of the severity of the condition. (CDC, <https://www.cdc.gov/csels/dsepd/ss1978/lesson3/section3.html>)

Reproduction rate: The basic reproduction number (R_0), also called the basic reproduction ratio or rate or the basic reproductive rate, is an epidemiologic metric used to describe the contagiousness or transmissibility of infectious agents. (CDC, https://wwwnc.cdc.gov/eid/article/25/1/17-1901_article)

Specifically, the number of COVID-19 deaths is divided by the number of infections to calculate the case-fatality rate. The average CFR of the antibody studies shown on the table is 0.26%.

COVID-19: Location	Infections (% of population)	Deaths	Case-Fatality Rate (CFR)
Los Angeles County, CA	367,000 (4.65%) ¹⁰	423 ¹¹	0.12%
Santa Clara County, CA	54,000 (2.8%) ¹²	94 ¹²	0.17%
Miami-Dade County, FL	165,000 (6%) ¹³	374 ¹⁴	0.23%
Arizona	226,000 (3.1%) ¹⁵	549 ¹⁶	0.24%
New York City, NY	2.075 million (24.7%) ¹⁷	10,746 ¹⁸	0.52%
Average CFR			0.26%

Table 1: Estimated CFR from antibody studies of SARS-CoV-2 conducted by several public health departments and research institutions.

COVID-19 Fatality and Reproduction Rate

Furthermore, on May 22, 2020, two months into the “shelter in place” order, PJ Media published an article titled, *The CDC Just Gave Us the Biggest Reason to End the Coronavirus Lockdowns* stating,

But, now here’s what the CDC is saying about the fatality rate the coronavirus:

0-49 years old: .05%

50-64 years old: .2%

65+ years old: 1.3%

Overall ages: .4%

According to the CDC’s current best estimate, the case fatality rate of the coronavirus is .4 percent. And that’s just amongst symptomatic cases, which, the CDC estimates, is 65 percent of all cases. This means the CDC estimates that the fatality rate for all infections across all age groups, symptomatic as well as asymptomatic, is approximately .26 percent.

Lastly, in an editorial in New England Journal of Medicine, Fauci et al. (2020) stated that “If one assumes that the number of asymptomatic or minimally symptomatic cases is several times as high as the number of reported cases, the case fatality rate may be considerably less than 1%. This suggests that the overall clinical consequences of Covid-19 may ultimately be more akin to those of a severe seasonal influenza (which has a case fatality rate of approximately 0.1%) or a pandemic influenza (similar to those in 1957 and 1968) rather than a disease similar to SARS or MERS, which have had case fatality rates of 9 to 10% and 36%, respectively.” (Fauci, A.S, et al., 2020).

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COVID-19 Current:

- Case Fatality - https://wwwnc.cdc.gov/eid/article/26/6/20-0320_article
- Reproductions Rate -
 - Ohio - <https://coronavirus.ohio.gov/wps/portal/gov/covid-19/resources/news-releases-news-you-can-use/basic-reproduction-number-pop-up-sites>
 - Globally - <https://epiforecasts.io/covid/posts/global/>

MERS:

- Case Fatality - <http://www.emro.who.int/health-topics/mers-cov/mers-outbreaks.html>
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SARS-CoV:

- Case fatality - https://www.who.int/csr/sars/country/table2003_09_23/en/
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Ebola:

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COVID-19 Fatality and Reproduction Rate

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Articles/Editorial:

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Guidance for Certifying COVID-19 Deaths

March 4, 2020

NCHS is receiving questions about how deaths involving the new coronavirus strain should be reported on death certificates. We are working on formal guidance to certifiers to be published as soon as possible. In the meantime, to address the immediate need, here is some basic information that can be shared in advance of the more formal and detailed guidance. It is important to emphasize that **Coronavirus Disease 2019** or **COVID-19** should be reported on the death certificate for all decedents where the disease caused or is assumed to have caused or contributed to death. Other terminology, e.g., SARS-CoV-2, can be used as long as it is clear that it indicates the 2019 coronavirus strain, but we would prefer use of WHO's standard terminology, e.g., COVID-19. Specification of the causal pathway leading to death in Part I of the certificate is also important. For example, in cases when COVID-19 causes pneumonia and fatal respiratory distress, both pneumonia and respiratory distress should be included along with COVID-19 in Part I. Certifiers should include as much detail as possible based on their knowledge of the case, medical records, laboratory testing, etc. If the decedent had other chronic conditions such as COPD or asthma that may have also contributed, these conditions can be reported in Part II. Here is an example:

CAUSE OF DEATH (See instructions and examples)		Approximate interval: Onset to death
32. PART I. Enter the <u>chain of events</u> —diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.		
IMMEDIATE CAUSE (Final disease or condition resulting in death)	a. <u>Acute respiratory distress syndrome</u> Due to (or as a consequence of):	<u>2 days</u>
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST	b. <u>Pneumonia</u> Due to (or as a consequence of):	<u>10 days</u>
	c. <u>COVID-19</u> Due to (or as a consequence of):	<u>10 days</u>
	d. _____ Due to (or as a consequence of):	
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I.		
33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No		
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input checked="" type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH <input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined

For more general guidance and training on cause-of-death reporting, certifiers can be referred to the Cause of Death mobile app available through <https://www.cdc.gov/nchs/nvss/mobile-app.htm> and the Improving Cause of Death Reporting online training module, which can be found at https://www.cdc.gov/nchs/nvss/improving_cause_of_death_reporting.htm.

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COVID-19 Alert No. 2

March 24, 2020

New ICD code introduced for COVID-19 deaths

This email is to alert you that a newly-introduced ICD code has been implemented to accurately capture mortality data for Coronavirus Disease 2019 (COVID-19) on death certificates.

Please read carefully and forward this email to the state statistical staff in your office who are involved in the preparation of mortality data, as well as others who may receive questions when the data are released.

What is the new code?

The new ICD code for Coronavirus Disease 2019 (COVID-19) is U07.1, and below is how it will appear in formal tabular list format.

U07.1 COVID-19

Excludes: Coronavirus infection, unspecified site (B34.2)
 Severe acute respiratory syndrome [SARS], unspecified (U04.9)

The WHO has provided a second code, **U07.2**, for clinical or epidemiological diagnosis of COVID-19 where a laboratory confirmation is inconclusive or not available. Because laboratory test results are not typically reported on death certificates in the U.S., NCHS is not planning to implement U07.2 for mortality statistics.

When will it be implemented?

Immediately.

Will COVID-19 be the underlying cause?

The underlying cause depends upon what and where conditions are reported on the death certificate. However, the rules for coding and selection of the underlying cause of death are expected to result in COVID-19 being the underlying cause more often than not.

What happens if certifiers report terms other than the suggested terms?

If a death certificate reports coronavirus without identifying a specific strain or explicitly specifying that it is not COVID-19, NCHS will ask the states to follow up to verify whether or not the coronavirus was COVID-19. As long as the phrase used indicates the 2019 coronavirus strain, NCHS expects to assign the new code. However, it is preferable and more straightforward for certifiers to use the standard terminology (COVID-19).

What happens if the terms reported on the death certificate indicate uncertainty?

If the death certificate reports terms such as “probable COVID-19” or “likely COVID-19,” these terms would be assigned the new ICD code. It is not likely that NCHS will follow up on these cases. If “pending COVID-19 testing” is reported on the death certificate, this would be considered a pending record. In this scenario, NCHS would expect to receive an updated record, since the code will likely result in R99. In this case, NCHS will ask the states to follow up to verify if test results confirmed that the decedent had COVID-19.

Do I need to make any changes at the jurisdictional level to accommodate the new ICD code?

Not necessarily, but you will want to confirm that your systems and programs do not behave as if U07.1 is an unknown code.

Should “COVID-19” be reported on the death certificate only with a confirmed test?

COVID-19 should be reported on the death certificate for all decedents where the disease caused **or is assumed to have caused or contributed to death**. Certifiers should include as much detail as possible based on their knowledge of the case, medical records, laboratory testing, etc. If the decedent had other chronic conditions such as COPD or asthma that may have also contributed, these conditions can be reported in Part II. (See attached Guidance for Certifying COVID-19 Deaths)

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Vital Statistics Reporting Guidance

Report No. 3 - April 2020



Guidance for Certifying Deaths Due to Coronavirus Disease 2019 (COVID–19)

Introduction

In December 2019, an outbreak of a respiratory disease associated with a novel coronavirus was reported in the city of Wuhan in the Hubei province of the People's Republic of China (1). The virus has spread worldwide and on March 11, 2020, the World Health Organization declared Coronavirus Disease 2019 (COVID–19) a pandemic (2). The first case of COVID–19 in the United States was reported in January 2020 (3) and the first death in February 2020 (4), both in Washington State. Since then, the number of reported cases in the United States has increased and is expected to continue to rise (5).

In public health emergencies, mortality surveillance provides crucial information about population-level disease progression, as well as guides the development of public health interventions and assessment of their impact. Monitoring and analysis of mortality data allow dissemination of critical information to the public and key stakeholders. One of the most important methods of mortality surveillance is through monitoring causes of death as reported on death certificates. Death certificates are registered for every death occurring in the United States, offering a complete picture of mortality nationwide. The death certificate provides essential information about the deceased and the cause(s) and circumstances of death. Appropriate completion of death certificates yields accurate and reliable data for use in epidemiologic analyses and public health reporting. A notable example of the utility of death certificates for public health surveillance is the ongoing monitoring of pneumonia and influenza deaths. Accurate and timely death certificate data are integral to detecting elevated levels of influenza activity in real time (<https://www.cdc.gov/flu/weekly/index.htm>).

Monitoring the emergence of COVID–19 in the United States and guiding public health response will also require accurate and timely death reporting. The purpose of this report is to provide guidance to death certifiers on proper cause-of-death certification for cases where confirmed or suspected COVID–19 infection resulted in death. As clinical guidance on COVID–19 evolves, this guidance may be updated, if necessary. When COVID–19 is determined to be a cause of death, it is important that it be reported on the death certificate to assess accurately the effects of this pandemic and appropriately direct public health response.

Cause-of-Death Reporting

When reporting cause of death on a death certificate, use any information available, such as medical history, medical records, laboratory tests, an autopsy report, or other sources of relevant information. Similar to many other diagnoses, a cause-of-death statement is an informed medical opinion that should be based on sound medical judgment drawn from clinical training and experience, as well as knowledge of current disease states and local trends (6).

Part I

This section on the death certificate is for reporting the sequence of conditions that led directly to death. The immediate cause of death, which is the disease or condition that directly preceded death and is not necessarily the underlying cause of death (UCOD), should be reported on line a. The conditions that led to the immediate cause of death should be reported in a logical sequence in terms of time and etiology below it.

The UCOD, which is “(a) the disease or injury which initiated the train of morbid events leading directly to death or (b) the circumstances of the accident or violence which produced the fatal injury” (7), should be reported on the lowest line used in Part I.

Approximate interval: Onset to death

For each condition reported in Part I, the time interval between the presumed onset of the condition, not the diagnosis, and death should be reported. It is acceptable to approximate the intervals or use general terms, such as hours, days, weeks, or years.

Part II

Other significant conditions that contributed to the death, but are not a part of the sequence in Part I, should be reported in Part II. Not all conditions present at the time of death have to be reported—only those conditions that actually contributed to death.

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Certifying deaths due to COVID-19

If COVID-19 played a role in the death, this condition should be specified on the death certificate. In many cases, it is likely that it will be the UCOD, as it can lead to various life-threatening conditions, such as pneumonia and acute respiratory distress syndrome (ARDS). In these cases, COVID-19 should be reported on the lowest line used in Part I with the other conditions to which it gave rise listed on the lines above it.

Generally, it is best to avoid abbreviations and acronyms, but COVID-19 is unambiguous, so it is acceptable to report on the death certificate.

In some cases, survival from COVID-19 can be complicated by pre-existing chronic conditions, especially those that result in diminished lung capacity, such as chronic obstructive pulmonary disease (COPD) or asthma. These medical conditions do not cause COVID-19, but can increase the risk of contracting a respiratory infection and death, so these conditions should be reported in Part II and not in Part I.

When determining whether COVID-19 played a role in the cause of death, follow the CDC clinical criteria for evaluating a person under investigation for COVID-19 and, where possible, conduct appropriate laboratory testing using guidance provided by CDC or local health authorities. More information on CDC recommendations for reporting, testing, and specimen collection, including postmortem testing, is available from: <https://www.cdc.gov/coronavirus/2019-nCoV/hcp/clinical-criteria.html> and <https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-postmortem-specimens.html>. It is important to remember that death certificate reporting may not meet mandatory reporting requirements for reportable diseases; contact the local health department regarding regulations specific to the jurisdiction.

In cases where a definite diagnosis of COVID-19 cannot be made, but it is suspected or likely (e.g., the circumstances are compelling within a reasonable degree of certainty), it is acceptable to report COVID-19 on a death certificate as “probable” or “presumed.” In these instances, certifiers should use their best clinical judgement in determining if a COVID-19 infection was likely. However, please note that testing for COVID-19 should be conducted whenever possible.

Common problems

Common problems in cause-of-death certification include:

1. reporting intermediate causes as the UCOD (i.e., on the lowest line used in Part I),
2. lack of specificity, and
3. illogical sequences.

Intermediate causes are those conditions that typically have multiple possible underlying etiologies and thus, a UCOD must

be specified on a line below in Part I. For example, pneumonia is an intermediate cause of death since it can be caused by a variety of infectious agents or by inhaling a liquid or chemical. Pneumonia is important to report in a cause-of-death statement but, generally, it is not the UCOD. The cause of pneumonia, such as COVID-19, needs to be stated on the lowest line used in Part I.

Additionally, the reported UCOD should be specific enough to be useful for public health and research purposes. For example, a “viral infection” can be a UCOD, but it is not specific. A more specific UCOD in this instance could be “COVID-19.”

All causal sequences reported in Part I should be logical in terms of time and pathology. For example, reporting “COVID-19” due to “chronic obstructive pulmonary disease” in Part I would be an illogical sequence as COPD cannot cause an infection, although it may increase susceptibility to or exacerbate an infection. In this instance, COVID-19 would be reported in Part I as the UCOD and the COPD in Part II. While there can be reasonable differences in medical opinion concerning a sequence that led to a particular death, the causes should always be provided in a logical sequence from the immediate cause on line a. back to the UCOD on the lowest line used in Part I.

Manner of death

The manner of death, sometimes referred to as circumstances of death, is also reported on death certificates. Natural deaths are due solely or almost entirely to disease or the aging process (8). In the case of death due to a COVID-19 infection, the manner of death will almost always be natural.

When to Refer to a Medical Examiner or Coroner

Some jurisdictions have requirements for referring deaths involving threats to public health to the medical examiner or coroner, so certifiers should follow the regulations in the jurisdiction in which the death occurred. As always, if a death involved an injury, poisoning, or complications thereof, then the case should be referred. The local medical examiner or coroner should be consulted with questions on referral requirements.

Conclusion

An accurate count of the number of deaths due to COVID-19 infection, which depends in part on proper death certification, is critical to ongoing public health surveillance and response. When a death is due to COVID-19, it is likely the UCOD and thus, it should be reported on the lowest line used in Part I of the death certificate. Ideally, testing for COVID-19 should be

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conducted, but it is acceptable to report COVID–19 on a death certificate without this confirmation if the circumstances are compelling within a reasonable degree of certainty.

For more guidance and training on cause-of-death reporting in general, see the Cause of Death mobile app available from: <https://www.cdc.gov/nchs/nvss/mobile-app.htm> and the Improving Cause of Death Reporting online training module available from: https://www.cdc.gov/nchs/nvss/improving_cause_of_death_reporting.htm (free Continuing Medical Education credits and Continuing Nursing Education credits available). For current information on the COVID–19 outbreak, see the CDC website at: <https://www.cdc.gov/coronavirus/2019-nCoV/index.html>.

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Appendix. Scenarios and Example Certifications for Deaths Due to COVID-19

Scenario I: A 77-year-old male with a history of hypertension and chronic obstructive pulmonary disease

A 77-year-old male with a 10-year history of hypertension and chronic obstructive pulmonary disease (COPD) presented to a local emergency department complaining of 4 days of fever, cough, and increasing shortness of breath. He reported recent exposure to a neighbor with flu-like symptoms. He stated that his wheezing was not improving with his usual bronchodilator therapy. Upon examination, he was febrile, hypoxic, and in

moderate respiratory distress. His chest x-ray demonstrated hyperinflation and his arterial blood gas was consistent with severe respiratory acidosis. Testing of respiratory specimens indicated COVID-19. He was admitted to the ICU and despite aggressive treatment, he developed worsening respiratory acidosis and sustained a cardiac arrest on day 3 of admission.

Comment: In this case, the acute respiratory acidosis was the immediate cause of death, so it was reported on line a. Acute respiratory acidosis was precipitated by the COVID-19 infection, which was reported below it on line b. in Part I. The COPD and hypertension were contributing causes but were not a part of the causal sequence in Part I, so those conditions were reported in Part II.

Scenario I

CAUSE OF DEATH (See instructions and examples)			Approximate interval: Onset to death
32. PART I. Enter the <u>chain of events</u> --diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.			
IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)	a. Acute respiratory acidosis	Due to (or as a consequence of):	3 days
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST	b. COVID-19	Due to (or as a consequence of):	1 week
	c.	Due to (or as a consequence of):	
	d.	Due to (or as a consequence of):	
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I			33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Chronic obstructive pulmonary disease, hypertension			34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH <input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined	

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Scenario II: A 34-year-old female with no significant past medical history

A 34-year-old female with no significant past medical history presented to her primary care physician complaining of 6 days of fever, cough, and myalgias. She was found to be febrile, hypotensive, and hypoxic. She was admitted to the hospital and underwent a CT scan of the chest, which revealed diffuse ground-glass opacification indicative of viral pneumonia. Respiratory specimens were sent for testing and rRT-PCR confirmed COVID-19. Her condition deteriorated over the next

2 days and she developed acute respiratory distress syndrome (ARDS). She was transferred to the ICU and started on positive pressure ventilation. Despite aggressive resuscitation, the patient expired on hospital day 4.

Comment: In this case, the immediate cause of death was ARDS, so it was reported on line a. as a consequence of pneumonia, which was reported on line b. The underlying cause of death (UCOD) was COVID-19 so it was reported on line c., the lowest line used in Part I.

Scenario II

CAUSE OF DEATH (See instructions and examples)			Approximate interval: Onset to death
<p>32. PART I. Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)</p> <p>Acute respiratory distress syndrome</p> <p>a. _____ Due to (or as a consequence of):</p> <p>Pneumonia</p> <p>b. _____ Due to (or as a consequence of):</p> <p>COVID-19</p> <p>c. _____ Due to (or as a consequence of):</p> <p>d. _____</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p>			
<p>PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input checked="" type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>	

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Scenario III: An 86-year-old female with an unconfirmed case of COVID-19

An 86-year-old female passed away at home. Her husband reported that she was nonambulatory after suffering an ischemic stroke 3 years ago. He stated that 5 days prior, she developed a high fever and severe cough after being exposed to an ill family member who subsequently was diagnosed with COVID-19. Despite his urging, she refused to go to the hospital, even when her breathing became more labored and temperature escalated. She was unresponsive that morning and her husband phoned emergency medical services (EMS). Upon EMS arrival, the

patient was pulseless and apneic. Her husband stated that he and his wife had advanced directives and that she was not to be resuscitated. After consulting with medical command, she was pronounced dead and the coroner was notified.

Comment: Although no testing was done, the coroner determined that the likely UCOD was COVID-19 given the patient's symptoms and exposure to an infected individual. Therefore, COVID-19 was reported on the lowest line used in Part I. Her ischemic stroke was considered a factor that contributed to her death but was not a part of the direct causal sequence in Part I, so it was reported in Part II.

Scenario III

CAUSE OF DEATH (See instructions and examples) 32. PART I. Enter the <u>chain of events</u> —diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary. IMMEDIATE CAUSE (Final disease or condition -----> resulting in death) Acute respiratory illness a. _____ Due to (or as a consequence of): b. Probable COVID-19 _____ Due to (or as a consequence of): c. _____ Due to (or as a consequence of): d. _____		Approximate interval: Onset to death 1 day _____ 5 days _____ _____ _____
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I Ischemic stroke		33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No 34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input checked="" type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH <input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined

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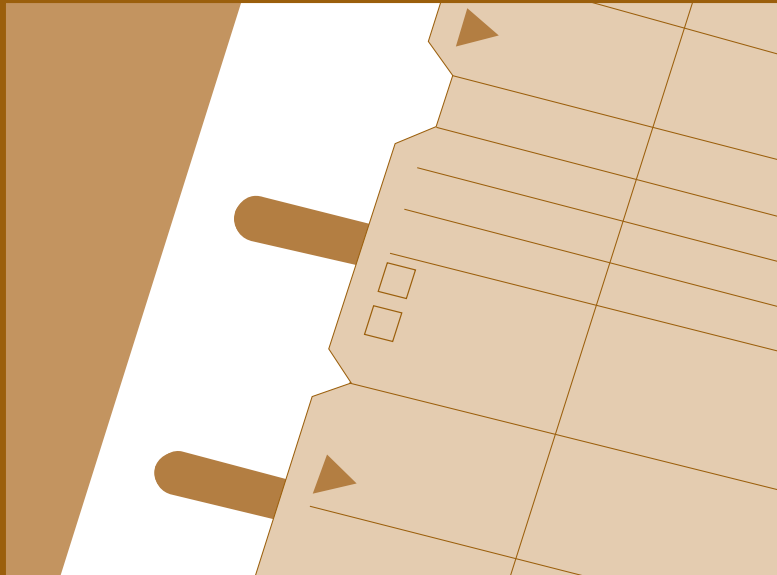
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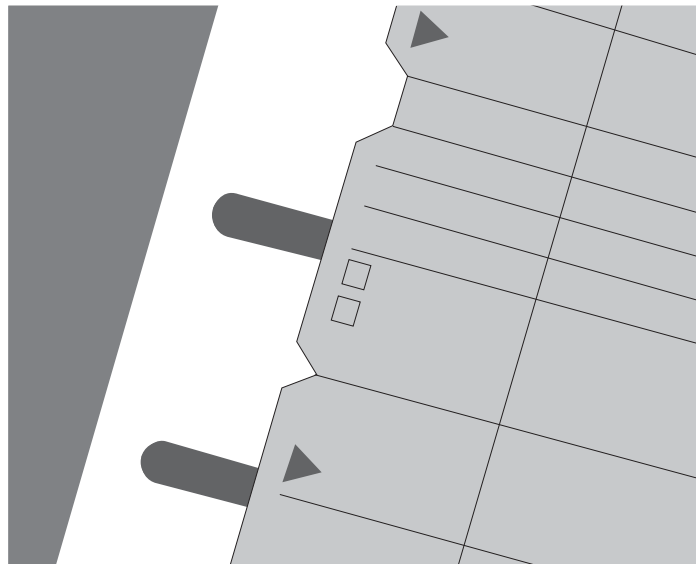
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Medical Examiners' and Coroners' Handbook on Death Registration and Fetal Death Reporting

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Preface

This handbook contains instructions for medical examiners and coroners on the registration of deaths and the reporting of fetal deaths. It was prepared by the Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics (NCHS). These instructions pertain to the 2003 revisions of the U.S. Standard Certificate of Death and the U.S. Standard Report of Fetal Death and the 1992 revision of the Model State Vital Statistics Act and Regulations. This handbook is intended to serve as a model that can be adapted by any vital statistics registration area.

Other handbooks and references on preparing and registering vital records are mentioned at the end of the section on “Medical Certification of Death” and are listed in the references. For most of these resources, the State vital statistics office or NCHS will be able to provide as many copies as requested.

Acknowledgments

This publication was prepared by staff from the Division of Vital Statistics led by Donna L. Hoyert, Ph.D., and Arialdi M. Minino, M.P.H. Martha L. Munson, M.S., provided content for fetal death items. Robert N. Anderson, Ph.D., also contributed to this handbook. Mary Anne Freedman, M.A., the Director of the Division of Vital Statistics while this publication was being prepared, reviewed and commented on the contents. Expert medical review and comments were provided by Randy Hanzlick, M.D.; Gregory G. Davis, M.D.; and Lillian R. Blackmon, M.D.

This handbook was edited by Kathy Sedgwick, typeset by Jacqueline M. Davis, and the graphics produced by Jarmila G. Ogburn of the Publications Branch, Division of Data Services.

Questions about mortality and cause-of-death issues may be directed to staff in the Mortality Statistics Branch, whereas questions about fetal death issues may be directed to Joyce A. Martin, M.P.H., or other staff in the Reproductive Statistics Branch of the Division of Vital Statistics, the Centers for Disease Control and Prevention's National Center for Health Statistics, Hyattsville, MD 20782.

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Introduction

Purpose

This handbook is designed to acquaint medical examiners and coroners with the vital registration system in the United States and to provide instructions for completing and filing death certificates and fetal death reports. Emphasis is directed toward the certification of medical information relating to these events when they come within the jurisdiction of the medical-legal officer (i.e., medical examiner or coroner).

A significant number of the deaths occurring in the United States must be investigated and certified by a medical-legal officer. Although State laws vary in specific requirements, deaths that typically require investigation are those due to unusual or suspicious circumstances, violence (accident, suicide, or homicide), those due to natural disease processes when the death occurred suddenly and without warning, when the decedent was not being treated by a physician, or the death was unattended (1).

In those cases where death is not the result of accident, suicide, or homicide, some States include in their laws a specific time period regarding how recently treatment must have been provided by a physician for that physician to be authorized to complete the medical certification of cause of death. These time limits vary from State to State. In some States where no time limit is specified, it is left to interpretation or local custom to determine whether the cause of death should be completed by a physician or by the medical examiner or coroner. The medical-legal officer should investigate the case and ensure that the medical certification of cause of death is properly completed.

Because State laws, regulations, and customs vary significantly regarding which cases must be investigated by a medical-legal officer, each medical examiner or coroner must become familiar with practices within the officer's area and ensure that all cases falling within his or her jurisdiction are properly investigated. If there is any doubt as to jurisdiction, the medical-legal officer should assume jurisdiction.

Importance of death registration and fetal death reporting

The death certificate is a permanent record of the fact of death, and depending on the State of death, may be needed to get a burial permit. The information in the record is considered as *prima facie* evidence of the fact of death that can be introduced in court as evidence. State law specifies the required time for completing and filing the death certificate.

The death certificate provides important personal information about the decedent and about the circumstances and cause of death. This information has many uses related to the settlement of the estate and provides family members' closure, peace of mind, and documentation of the cause of death.

The death certificate is the source for State and national mortality statistics (figures 1–3) and is used to determine which medical conditions receive research and development funding, to set public health goals, and to measure health status at local, State, national, and international levels. The Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) publishes summary mortality data in the *National Vital Statistics Report* publication "Deaths: Final data" and on the Internet at <http://www.cdc.gov/nchs> (under vital statistics, mortality).

These mortality data are valuable to physicians indirectly by influencing funding that supports medical and health research (which may alter clinical practice) and directly as a research tool. Research topics include identifying disease etiology, evaluating diagnostic and therapeutic techniques, examining medical or mental health problems that may be found among specific groups of people (2), and indicating areas in which medical research can have the greatest impact on reducing mortality.

Analyses typically focus on a single condition reported on the death certificate, but some analyses do consider all conditions mentioned. Such analyses are important in studying certain diseases and conditions and in investigating relationships between conditions reported on the same death certificate (for example, types of fatal injuries and automobile crashes or types of infections and HIV).

Because statistical data derived from death certificates can be no more accurate than the information provided on the certificate, it is very important that all persons concerned with the registration of deaths strive not only for complete registration, but also for accuracy and promptness in reporting these events. Furthermore, the potential usefulness of detailed specific information is greater than more general information.

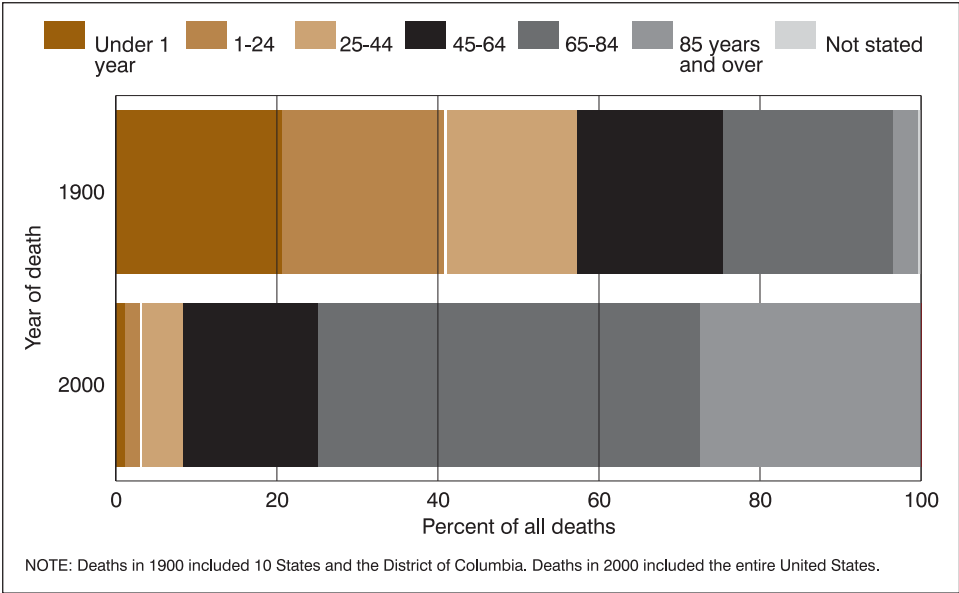


Figure 1. Deaths by age

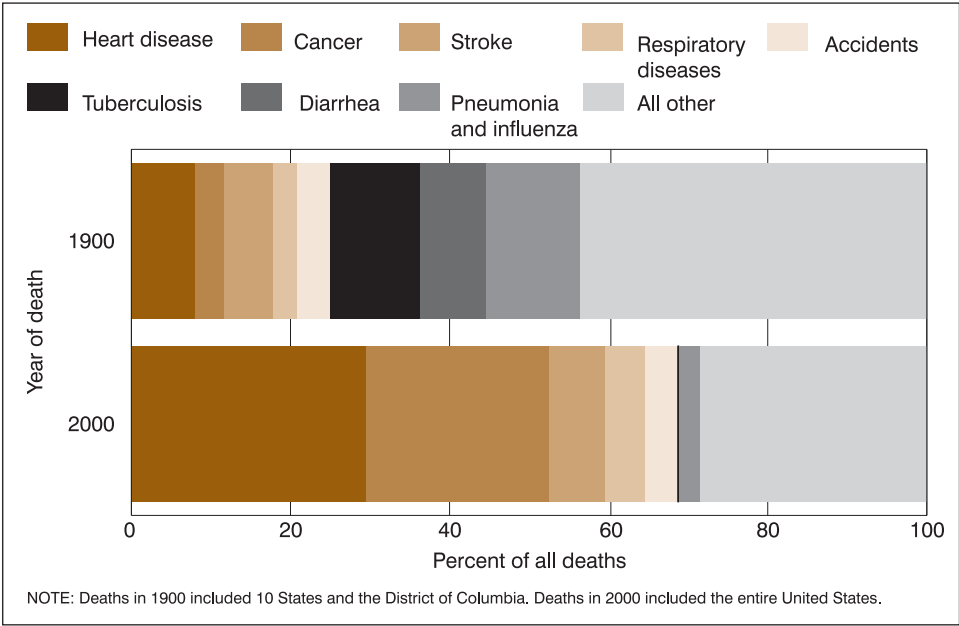


Figure 2. Deaths by cause

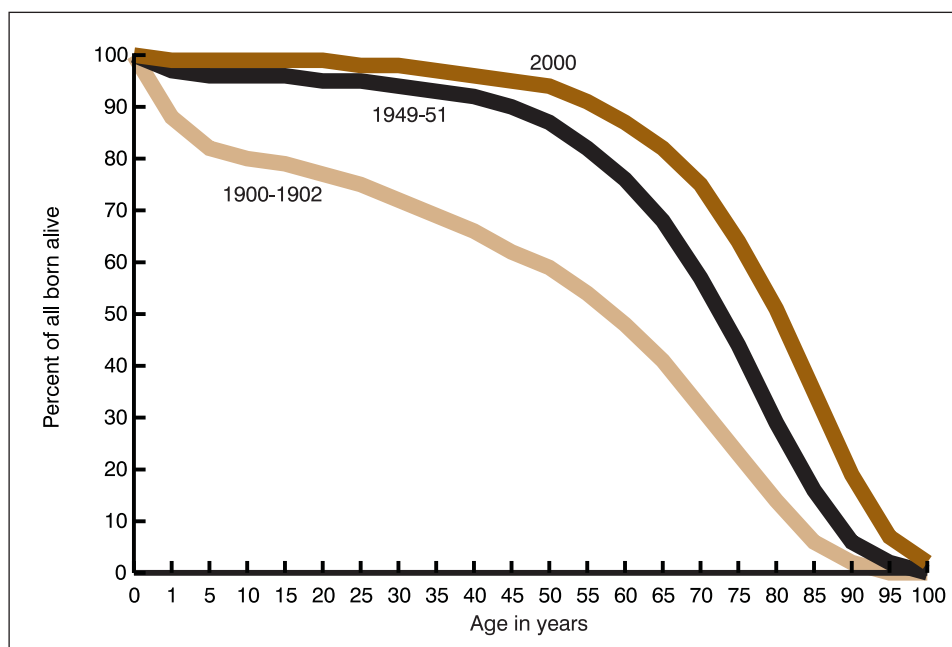


Figure 3. Percent of persons born alive in selected years surviving to specific ages

The fetal death report is recommended as a legally required statistical report designed primarily to collect information for statistical and research purposes. In most States, these reports are not maintained in the official files of the State health department, and certified copies of these reports are rarely issued. However, in a number of States, it remains a legal certificate. The record, whether a certificate or a report, provides valuable health and research data. The information is used to study the causes of poor pregnancy outcome. These data are also essential in planning and evaluating prenatal care services and obstetrical programs. They are also used to examine the consequences of possible environmental and occupational exposures of parents on the fetus.

U.S. Standard Certificates and Reports

The registration of deaths and fetal deaths is a State function supported by individual State laws and regulations. The original certificates are filed in the States and stored in accordance with State practice. Each State has a contract with NCHS that allows the Federal Government to use information from the State records to produce national vital statistics. The national data program is called the National Vital Statistics System (NVSS) (3,4).

To ensure consistency in the NVSS, NCHS provides leadership and coordination in the development of a standard certificate of death for the States to use as a model. The standard certificate is revised periodically to ensure that the data collected relate to current and anticipated needs. In the revision process, stakeholders review and evaluate each item on the standard certificate for its registration, legal, genealogical, statistical, medical, and research value. The associations on the stakeholder panel that recommended the current U.S. Standard Certificate of Death included the American Medical Association, the National Association of Medical Examiners, the College of American Pathologists, and the American Hospital Association (3). For the U.S. Standard Report of Fetal Death, the associations included the American Academy of Pediatrics, American College of Obstetricians and Gynecologists, Association of State and Territorial Health Officers (Maternal and Child Health Affiliate), American Medical Association, and American College of Nurse Midwives (3).

Most State certificates conform closely in content and arrangement to the standard. Minor modifications are sometimes necessary to comply with State laws or regulations or to meet specific information needs. Having similar forms promotes uniformity of data and comparable national statistics. They also allow the comparison of individual State data with national data and data from other States. Uniformity of death certificates among the States also increases their acceptability as legal records.

Confidentiality of vital records

To encourage appropriate access to vital records, NCHS promotes the development of model vital statistics laws concerning confidentiality (1). State laws and supporting regulations define which persons have authorized access to vital records. Some States have few restrictions on access to death certificates. However, there are restrictions on access to death certificates in the majority of States. Legal safeguards to the confidentiality of vital records have been strengthened over time in some States.

The fetal death report is designed primarily to collect information for statistical and research purposes. In many States these records are not maintained in the official files of the State health department. Most States never issue certified copies of these records; the other States issue certified copies very rarely.

Responsibility of the medical examiner or coroner

Death registration

The principal responsibility of the medical examiner or coroner in death registration is to complete the medical part of the death certificate. Before

delivering the death certificate to the funeral director, he or she may add some personal items for proper identification such as name, residence, race, and sex. Under certain circumstances and in some jurisdictions, he or she may provide all the information, medical and personal, required on the certificate.

The funeral director, or other person in charge of interment, will otherwise complete those parts of the death certificate that call for personal information about the decedent. He or she is also responsible for filing the certificate with the registrar where the death occurred. Each State prescribes the time within which the death certificate must be filed with the registrar.

In general, the duties of the medical examiner or coroner are to:

- Complete relevant portions of the death certificate.
- Deliver the signed or electronically authenticated death certificate to the funeral director promptly so that the funeral director can file it with the State or local registrar within the State's prescribed time period.
- Assist the State or local registrar by answering inquiries promptly.
- Deliver a supplemental report of cause of death to the State vital statistics office when autopsy findings or further investigation reveals the cause of death to be different from what was originally reported.

When the cause of death cannot be determined within the statutory time limit, a death certificate should be filed with the notation that the report of cause of death is "deferred pending further investigation." A permit to authorize disposal or removal of the body may then be obtained.

If there are other reasons for a delay in completing the medical portion of the certificate, the registrar should be given written notice of the reason for the delay.

When the circumstances of death (accident, suicide, or homicide) cannot be determined within the statutory time limit, the cause-of-death section should be completed and the manner of death should be shown as "pending investigation."

As soon as the cause of death and circumstances or manner of death are determined, the medical examiner or coroner should file a supplemental report with the registrar or correct or amend the death certificate according to State and local regulations regarding this procedure.

When a body has been found after a long period of time, the medical examiner or coroner should estimate the date and time of death as accurately as possible. If an estimate is made, the information should be entered as “APPROX—date” and/or “APPROX—time.”

If completed properly, the cause of death will communicate the same essential information that a case history would (5). For example, the following cause-of-death statement is complete:

- I a) Septic shock
 - b) Infected decubitus ulcers
 - c) Complications of cerebral infarction
 - d) Cerebral artery atherosclerosis
- II Insulin-dependent diabetes mellitus

If not completed properly, information may be missing from the cause-of-death section, so someone reading the cause of death would not know why the condition on the lowest used line developed. For example:

- I a) Pneumonia
 - b) Malnutrition
- II

This example does not explain what caused malnutrition. A variety of different circumstances could cause malnutrition, so the statement is incomplete and ambiguous.

In some cases, the medical-legal officer will be contacted to verify information reported on a death certificate or to provide additional information to clarify what was meant. The original cause-of-death statement may not be wrong from a clinical standpoint, but may not include sufficient information for assigning codes for statistical purposes. Following guidelines in this handbook should minimize the frequency with which the medical examiner or coroner will need to spend additional time answering follow-up questions about a patient's cause of death.

Fetal death reporting

In some jurisdictions the medical-legal officer is required to complete reports of fetal death when the fetal death occurred without medical attendance or occurred under strange or unusual circumstances or was a result of an accident, suicide, or homicide. When completing a report of fetal death, the medical examiner or coroner is to:

- Complete the cause-of-fetal-death section.

- Return the fetal death report to the person or institution charged by State law with the responsibility for filing the report.
- If the medical-legal officer is required by State law to fill out a report of fetal death when the fetal death occurs outside a hospital or other institution, complete such a report and send it directly to the local or State registrar.

When an abandoned infant or apparent newborn is found dead, a problem may arise as to whether the event should be registered as a fetal death or an infant death (see [appendix E](#) for definitions). If the infant is considered to have lived, even for a very short time, following delivery, then the medical examiner or coroner will use the death certificate usually employed. He or she must also ensure that the birth of this infant is properly registered. If the infant is considered to be a fetal death or stillborn, then the appropriate fetal death report must be completed.

General Instructions for Completing Certificates and Reports

Aside from the facts related to medical certification, the medical examiner or coroner may need to obtain some or all of the personal information required on the certificate or report.

In some jurisdictions the medical-legal officer is not required to complete all of the personal items. He or she may complete and sign the medical certification section and add a few identifying items, such as name, age, sex, race, and residence. The certificate or report is then given to the funeral director who completes the remainder of the record.

In other jurisdictions the medical-legal officer customarily completes all the personal items. Under such conditions the medical examiner or coroner must obtain the information from an informant who has knowledge of the facts.

The informant is usually a member of the family or a friend of the family. The following individuals can be the informant and are listed in order of preference: spouse, a parent, a child of the decedent, another relative, or other person who has knowledge of the facts. At times the medical examiner or coroner will have to obtain personal information from a physician or a hospital official. In some cases, information will be obtained from the police.

Whatever the source may be, the name, relationship to decedent, and mailing address of the informant must appear on the certificate in the space provided.

It is essential that certificates and reports be prepared as permanent durable records. Completing a death certificate involves the following guidelines:

- Use the current form designated by the State.
- Complete each item, following the specific instructions for that item.
- Take care to make entry legible. Use a computer printer with high resolution, typewriter with good black ribbon and clean keys, or print legibly using permanent **black** ink.

- Do not use abbreviations except those recommended in the specific item instructions.
- Verify with the informant the spelling of names, especially those that have different spellings for the same sound (Smith or Smyth, Gail or Gayle, Wolf or Wolfe, and so forth).
- Refer problems not covered in these instructions to the State office of vital statistics or to the local registrar.
- Obtain all signatures; rubber stamps or other facsimile signatures are not acceptable. If jurisdiction provides, authenticate electronically.
- Do not make alterations or erasures.
- File the original certificate or report with the registrar. Reproductions or duplicates are not acceptable.
- File a supplemental report after investigation is completed for records previously filed as “pending further investigation.”

Medical Certification of Death

Certifying the cause of death

The medical examiner or coroner's primary responsibility in death registration is to complete the medical part of the death certificate. The medical certification includes:

- Date and time pronounced dead;
- Date and time of death;
- Question on whether the case was referred to the medical examiner or coroner;
- Cause-of-death section including cause of death, manner of death, tobacco use, and pregnancy status items;
- Injury items for cases involving injuries;
- Certifier section with signatures.

The proper completion of this section of the certificate is of utmost importance to the efficient working of a medical-legal investigative system.

Cause of death

This section must be completed by the medical examiner or coroner. The cause-of-death section, a facsimile of which is shown on page 12, follows guidelines recommended by the World Health Organization. An important feature is the reported underlying cause of death determined by the medical examiner or coroner and defined as (a) the disease or injury that initiated the train of morbid events leading directly to death, or (b) the circumstances of the accident or violence that produced the fatal injury. In addition to the underlying cause of death, this section provides for reporting the entire sequence of events leading to death as well as other conditions significantly contributing to death (6).

The cause-of-death section is designed to elicit the opinion of the medical certifier. Causes of death on the death certificate represent a medical opinion that might vary among individual medical-legal officers. A properly

completed cause-of-death section provides an etiological explanation of the order, type, and association of events resulting in death. The initial condition that starts the etiological sequence is specific if it does not leave any doubt as to why it developed. For instance, sepsis is not specific because a number of different conditions may have resulted in sepsis, whereas Human immunodeficiency virus infection is specific.

In certifying the cause of death, any disease, abnormality, injury, or poisoning, if believed to have adversely affected the decedent, should be reported. If the use of alcohol and/or other substance, a smoking history, or a recent pregnancy, injury, or surgery was believed to have contributed to death, then this condition should be reported. The conditions present at the time of death may be completely unrelated, arising independently of each other; or they may be causally related to each other, that is, one condition may lead to another which in turn leads to a third condition, and so forth. Death may also result from the combined effect of two or more conditions.

The mechanism of death, such as cardiac or respiratory arrest, should not be reported as it is a statement not specifically related to the disease process, and it merely attests to the fact of death. The mechanism of death therefore provides no additional information on the cause of death.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the <u>chain of events</u>—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition) -----> resulting in death</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p> <p>a. _____ Due to (or as a consequence of):</p> <p>b. _____ Due to (or as a consequence of):</p> <p>c. _____ Due to (or as a consequence of):</p> <p>d. _____</p>				<p>33. WAS AN AUTOPSY PERFORMED?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p>				<p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p>	<p>39. TIME OF INJURY</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p>	<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>42. LOCATION OF INJURY: State: _____ City or Town: _____</p> <p>Street & Number: _____ Apartment No.: _____ Zip Code: _____</p>				
<p>43. DESCRIBE HOW INJURY OCCURRED:</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify): _____</p>	

As can be seen, the cause-of-death section consists of two parts. The first part is for reporting the sequence of events leading to death, proceeding backwards from the final disease or condition resulting in death. So, each condition in Part I should cause the condition above it. A specific cause of death should be reported in the last entry in Part I so there is no ambiguity about the etiology of this cause. Other significant conditions that contributed to the death, but did not lead to the underlying cause, are reported in Part II.

In addition, there are questions relating to autopsy, manner of death (for example, accident), and injury. The cause of death should include information provided by the pathologist if an autopsy or other type of postmortem examination is done. For deaths that have microscopic examinations pending at the time the certificate is filed, the additional information should be reported as soon as it is available. If the medical examiner or coroner has any questions about the procedure for doing this, contact the registrar.

The completion of the cause-of-death section for a medical-legal case requires careful consideration due to special problems that may be involved. The medical-legal case may depend upon toxicological examination for its ultimate cause-of-death certification (a situation not encountered as frequently in ordinary medical practice). Occasionally the medical examiner or coroner must deal with death certifications in which the cause of death is not clear, even after autopsy and toxicological examination. Despite these special problems that the medical examiner or coroner may encounter in dealing with causes of death, it is important that the medical certification be as accurate and complete as circumstances allow.

For statistical and research purposes, it is important that the causes of death and, in particular, the underlying cause of death, be reported as specifically and as precisely as possible. Careful reporting results in statistics for both underlying and multiple causes of death (i.e., all conditions mentioned on a death certificate) reflecting the best medical opinion.

Every cause-of-death statement is coded and tabulated in the statistical offices according to the latest revision of the *International Classification of Diseases* (6). When there is a problem with the reported cause of death (e.g., when a causal sequence is reported in reverse order), the rules provide a consistent way to select the most likely underlying cause. However, it is better when rules designed to compensate for poor reporting are not invoked, so that the rules are confirming the physician's statement rather than imposing assumptions about what the physician meant.

Statistically, mortality research focuses on the underlying cause of death because public health interventions seek to break the sequence of causally

related medical conditions as early as possible. However, all cause information reported on death certificates is important and is analyzed.

In the sections that follow, detailed instructions are given on how to complete Parts I and II. A number of examples of properly completed certificates with case histories are provided in this section to illustrate how the cause of death should be reported. Some common problems are also discussed later in this section.

Changes to cause of death

Should additional medical information or autopsy findings become available that would change the cause or causes of death originally reported, the original death certificate should be amended by the medical-legal officer by **immediately** reporting the revised cause of death to the State vital records office or local registrar.

Instructions

The cause-of-death section consists of two parts. **Part I** is for reporting a chain of events leading directly to death, with the **immediate cause** of death (the final disease, injury, or complication directly causing death) on line (a) and the **underlying cause** of death (the disease or injury that initiated the chain of events that led directly and inevitably to death) on the lowest used line. **Part II** is for reporting all other significant diseases, conditions, or injuries that contributed to death but which did not result in the underlying cause of death given in **Part I**.

The cause-of-death information should be the medical examiner's or coroner's best medical OPINION. Report each disease, abnormality, injury, or poisoning that the medical examiner or coroner believe adversely affected the decedent. A condition can be listed as "probable" even if it has not been definitively diagnosed.

If an organ system failure (such as congestive heart failure, hepatic failure, renal failure, or respiratory failure) is listed as a cause of death, always report its etiology on the line(s) beneath it (for example, renal failure **due to** Type I diabetes mellitus or renal failure **due to** ethylene glycol poisoning).

When indicating neoplasms as a cause of death, include the following: a) primary site or that the primary site is unknown, b) benign or malignant, c) cell type or that the cell type is unknown, d) grade of neoplasm, and e) part or lobe of organ affected (for example, a primary well-differentiated squamous cell carcinoma, lung, left upper lobe).

For each fatal injury (for example, stab wound of chest or gunshot wound) or poisoning, always report the trauma (for example, transection of subclavian vein or perforation of heart or pulmonary hemorrhage), and impairment of function (for example, air embolism or cardiac tamponade) that contributed to death.

Part I of the cause-of-death section

Only one cause is to be entered on each line of Part I. Additional lines should be added between the printed lines when necessary. For each cause, indicate in the space provided the approximate interval between the date of onset (not necessarily the date of diagnosis) and the date of death. For clarity, do not use parenthetical statements and abbreviations when reporting the cause of death. The underlying cause of death should be entered on the LOWEST LINE USED IN PART I. The underlying cause of death is the disease or injury that started the sequence of events leading directly to death or the circumstances of the accident or violence that produced the fatal injury. In the case of a violent death, the form of external violence or accident is antecedent to an injury entered, although the two events may be almost simultaneous.

Conditions in Part I should represent a distinct sequence so that each condition may be regarded as being the consequence of the condition entered immediately below it. When a condition does not seem to fit into such a sequence, consider whether it belongs in Part II.

Line (a) immediate cause

In Part I, the immediate cause of death is reported on line (a). This is the final disease, injury, or complication directly causing the death. An immediate cause of death must always be reported on line (a). It can be the sole entry in the cause-of-death section if that condition is the only condition causing the death.

In the case of a violent death, enter the result of the external cause (for example, fracture of vault of skull, crushed chest).

The immediate cause does not mean the mechanism of death or terminal event (for example, cardiac arrest or respiratory arrest). The mechanism of death (for example, cardiac or respiratory arrest) should not be reported as the immediate cause of death as it is a statement not specifically related to the disease process, and it merely attests to the fact of death. The mechanism of death therefore provides no additional information on the cause of death.

Lines (b), (c), and (d) due to (or as a consequence of)

On line (b) report the disease, injury, or complication, if any, that gave rise to the immediate cause of death reported on line (a). If this, in turn, resulted from a further condition, record that condition on line (c). If this in turn resulted from a further condition, record that condition on line (d). For as many conditions as are involved, write the full sequence, one condition per line, with the most recent condition at the top, and the underlying cause of death reported on the lowest line used in Part I. If more than four lines are needed, add additional lines (writing “due to” between conditions on the same line is the same as drawing an additional line) rather than using space in Part II to continue the sequence. The certification on page 18 is an example in which an additional line was necessary.

The words “due to (or as a consequence of),” which are printed between the lines of Part I, apply not only in sequences with an etiological or pathological basis and usually a chronological time ordering, but also to sequences in which an antecedent condition is believed to have prepared the way for a subsequent cause by damage to tissues or impairment of function.

If the immediate cause of death arose as a complication of or from an error or accident in surgery or other medical procedure or treatment, it is important to report what condition was being treated, what medical procedure was performed, what the complication or error was, and what the result of the complication or error was.

In case of injury, the form of external violence or accident is antecedent to an injury entered although the two events are almost simultaneous (for example, automobile accident or fallen on by tree).

Approximate interval between onset and death

Space is provided to the right of lines (a), (b), (c), and (d) for recording the interval between the presumed onset of the condition (not the diagnosis of the condition) and the date of death. This should be entered for all conditions in Part I. These intervals usually are established by the medical examiner or coroner on the basis of available information. In some cases the interval will have to be estimated. The terms “unknown” or “approximately” may be used. General terms, such as minutes, hours, or days, are acceptable, if necessary. If the time of onset is entirely unknown, state that the interval is “unknown.” Do not leave these items blank.

This information is useful in coding certain diseases and also provides a useful check on the accuracy of the reported sequence of conditions.

Part II of the cause-of-death section (other significant conditions)

All other important diseases or conditions that were present at the time of death and that may have contributed to the death, but did not lead to the underlying cause of death listed in Part I or were not reported in the chain of events in Part I, should be recorded on these lines. (More than one condition can be reported per line in Part II.)

For example, a patient who died of alcoholism may also have had a hypertensive heart disease that contributed to the death. In this case, the hypertensive heart disease would be entered in Part II as a contributory cause of death. If a decedent was pregnant, or less than 43 days postpartum at the time of death, and the pregnancy contributed to death, the fact of pregnancy should be indicated here. If the presence of infectious disease has not been noted in Part I, record it here.

Multiple conditions and sequences of conditions resulting in death are common, particularly among the elderly. When there are two or more possible sequences resulting in death, or if two conditions seem to have added together (e.g., stabbing caused both right intrathoracic hemorrhage and air embolism), choose and report in Part I the sequence or condition thought to have had the greatest impact (7). Other conditions or conditions from the other sequence(s) should be reported in Part II. For example, in the case of a diabetic male with chronic ischemic heart disease who dies from pneumonia, the medical examiner or coroner must choose the sequence of conditions that had the greatest impact and report this sequence in Part I. One possible sequence that the certifier might report would be pneumonia due to diabetes mellitus in Part I with chronic ischemic heart disease reported in Part II. Another possibility would be pneumonia due to the chronic ischemic heart disease entered in Part I with diabetes mellitus reported in Part II. Or the certifier might consider the pneumonia to be due to the ischemic heart disease that was due to the diabetes mellitus and report this entire sequence in Part I. Because these three different possibilities would be coded very differently, it is very important for the certifying medical examiner or coroner to decide which sequence most accurately describes the conditions causing death.

For some cases it may not be possible to make a precise determination of interacting causes of death. For these cases a judgment may be made. In cases of doubt, it may be necessary to use qualifying phrases in either Part I or Part II to reflect uncertainty as to which conditions led to death. In cases where the certifier is unable to establish a cause of death based upon reasonable medical certainty or that such a condition was more probably than not the cause of death, he or she should enter "unknown" in

the cause-of-death section. However, “unknown” should be used only after all possible efforts, including an autopsy, have been made to determine the cause.

The following certification is an example in which the cause-of-death section was modified to record all conditions related to the immediate cause of death.

CAUSE OF DEATH (See instructions and examples)			
32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.			Approximate interval: Onset to death
IMMEDIATE CAUSE (Final disease or condition resulting in death)			minutes
a. <u>Asphyxia by vomitus</u> Due to (or as a consequence of):			hours
b. <u>Cerebellar hemorrhage</u> Due to (or as a consequence of):			about 3 years
c. <u>Hypertension</u> Due to (or as a consequence of):			3 + years
UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST			3+ years
d. <u>Primary aldosteronism</u>			
e. <u>Adrenal adenoma</u>			
PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.			33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Congestive heart failure			34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH <input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined	
38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)	39. TIME OF INJURY	40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)	41. INJURY AT WORK? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
42. LOCATION OF INJURY: State: _____ City or Town: _____			
Street & Number: _____ Apartment No.: _____ Zip Code: _____			
43. DESCRIBE HOW INJURY OCCURRED:			44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)

Other items for medical certification

The remaining items that require the medical examiner's or coroner's certification relate to autopsy, manner of death, female decedent's pregnancy status, if tobacco use contributed to death, and injury.

Autopsy—The medical examiner or coroner should indicate whether an autopsy was performed and whether the findings were available to complete the cause of death. A separate report provides case histories and examples of medical certification after autopsy (8).

If additional medical information or autopsy findings are received after the medical examiner or coroner has certified to the cause of death and he or she determines the cause to be different from that originally entered on the death certificate, the original certificate should be amended by filing a

supplemental report of cause of death with the State registrar. Information on the proper form to use and procedure to follow can be obtained from his or her State registrar.

Circumstances of injury or violence—Space is provided on the death certificate for reporting the manner of death; check one of the following boxes: Natural, Accident, Suicide, Homicide, Pending Investigation, or Could not be determined. If “Pending Investigation” is checked, it should be changed after the investigation is completed. The appropriate State amendment procedures should be used to modify this item.

When the death was the result of an external cause, the medical examiner or coroner should specify whether it was an accident, suicide, or homicide and describe the circumstances in items 38–44. In item 43 a clear, brief statement as to how the injury occurred should be made, indicating the circumstances or cause, such as “Burned using gasoline to light stove,” “Slipped and fell while shoveling snow,” “Self-inflicted handgun wound,” or “Stabbed by sharp instrument.”

Bearing in mind that accident prevention programs, assessment of motor vehicle fatalities, and so forth, depend upon the proper wording of this item, the medical examiner or coroner should, in as few words as possible, describe the injury-producing situation. If the death was due to a vehicular accident, be sure to indicate whether the decedent was a driver, passenger, or pedestrian, and the type of vehicle(s) involved.

The medical examiner or coroner should state whether the injury occurred while the deceased was at work at his or her usual occupation and give the specific location where the accident took place.

The National Association of Medical Examiners has put together a guide on how **manner** of death may be determined (9). In certain cases, the manner of death preferred by the medical examiner community and the disease classification differ. As a result, it is important to specify the circumstances (e.g., item 43) involved so that both communities are able to make appropriate use of the information.

In the cases of violent death where the medical examiner or coroner cannot decide which of the terms—accident, suicide, or homicide—best describes the manner of death, “Could not be determined” should be checked. The medical examiner or coroner should bear in mind that “Could not be determined” is intended solely for cases in which it is impossible to establish with reasonable medical certainty the circumstances of death after thorough investigation. This category should not be used for cases “Pending Investigation.”

Special problems for the medical-legal officer

The medical examiner or coroner may experience little difficulty completing most of the items on the death certificate if death occurred under well-defined circumstances. Frequently, however, direct evidence related to cause of death is nonexistent, or there is some doubt concerning facts related to the individual. Under these circumstances, the medical-legal officer should report the facts when they are available, make estimations where such are possible, and where no facts are known and no estimations possible, indicate "Unknown."

Some special problems related to certification by a medical-legal officer are discussed below.

Precision of knowledge required to complete death certificate items

The cause-of-death section in the medical examiner's or coroner's certification is always a medical **opinion**. This opinion is, of course, a synthesis of all information derived from both the investigation into the circumstances surrounding the death and the autopsy, if performed. It represents the best effort of the medical examiner or coroner to reduce to a few words his or her entire synthesis of the cause of death.

In some cases, certain items (such as age or race) may be unknown and the medical examiner or coroner must make his or her best estimate of these items. A best estimate of the manner of death and the time and date of injury may also be required when neither investigation nor examination of the deceased provides definitive information.

The medical examiner or coroner may wish to devote some thought to the degree of "proof" necessary to properly certify deaths that may later be involved in litigation. He or she may wish to consider that the proof required in a criminal proceeding is of a higher degree of positivity than that required in a civil proceeding.

Trauma as a cause of death

It should be noted by all medical-legal officers that if trauma is either the underlying cause of death or a contributing cause of death, the manner of the onset of the trauma must be indicated; that is, the trauma must have been initiated by an accident, a suicidal venture, or a homicidal event. It may be impossible for the certifier to determine which of these three fits the particular case at hand, in which case it may be necessary to state that the manner of death could not be determined. If trauma is listed in Part I or II of item 32, then items 38-44 must be completed.

The National Association of Medical Examiners makes the following distinctions between manners of death (9):

Natural—“due solely or nearly totally to disease and/or the aging process.”

Accident—“there is little or no evidence that the injury or poisoning occurred with intent to harm or cause death. In essence, the fatal outcome was unintentional.”

Suicide—“results from an injury or poisoning as a result of an intentional, self-inflicted act committed to do self-harm or cause the death of one’s self.”

Homicide—“occurs when death results from...” an injury or poisoning or from “...a volitional act committed by another person to cause fear, harm, or death. Intent to cause death is a common element but is not required for classification as homicide.”

Could not be determined—“used when the information pointing to one manner of death is no more compelling than one or more other competing manners of death when all available information is considered.”

Pending investigation—used when determination of manner depends on further information.

One of the more difficult tasks of the medical examiner or coroner is to determine whether a death is an accident or the result of an intent to end life. The medical examiner or coroner must use all information available to make a determination about the death. This may include information from his or her own investigation, police reports, staff investigations, and discussions with the family and friends of the decedent.

Determining a suicide

- There is evidence that death was self-inflicted. Pathological (autopsy), toxicological, investigatory, and psychological evidence, and statements of the decedent or witnesses, may be used for this determination.
- There is evidence (explicit and/or implicit) that at the time of injury the decedent intended to kill self or wished to die and that the decedent understood the probable consequences of his or her actions.
 - Explicit verbal or nonverbal expression of intent to kill self
 - Implicit or indirect evidence of intent to die, such as the following:

- Expression of hopelessness
- Effort to procure or learn about means of death or rehearse fatal behavior
- Preparations for death, inappropriate to or unexpected in the context of the decedent's life
- Expression of farewell or desire to die, or acknowledgment of impending death
- Precautions to avoid rescue
- Evidence that decedent recognized high potential lethality of means of death
- Previous suicide attempt
- Previous suicide threat
- Stressful events or significant losses (actual or threatened)
- Serious depression or mental disorder (10,11)

When cause cannot be determined

It is well known that a professionally competent, searching autopsy and toxicological examination of the body fluids and organs, coupled with the best available bacteriologic, virologic, and immunologic studies, may fail to reveal the cause of death.

If this is the case and if the investigation has been pursued as far as possible, then the medical examiner or coroner will have no recourse but to indicate in one form or another that the cause of death “Could not be determined.” One possible phrase is “Cause of death not determined at autopsy and toxicological examination.” This is better than the term “Unknown” as it at least indicates the extent of the investigation undertaken.

Deferred “pending investigation”

Most, if not all, medical-legal investigative systems make provisions for cases in which the cause or manner of death cannot be immediately determined. Local laws vary somewhat as to how to handle such cases.

The procedure followed most frequently is to require that the death certificate be completed insofar as possible and filed within the time limits specified by law. Once the cause and/or manner of death are determined, a supplemental report must be prepared and filed by the medical-legal officer. This supplemental report becomes a part of the death certificate that is on file for the decedent.

It should be emphasized that the death certificate that is filed is to be completed insofar as possible. In other words, if the cause of death is known, but it is not known whether it was the result of an accident, suicide, or homicide, the death certificate that is filed should include the cause of death and show the manner of death in item 37 as "Pending Investigation." THE CAUSE OF DEATH SHOULD NEVER BE LEFT BLANK OR SHOWN AS "PENDING" WHEN IT IS KNOWN BUT THE MANNER OF DEATH, ACCIDENT, SUICIDE, OR HOMICIDE IS UNKNOWN.

The concept of "pending investigation" is made more necessary by the gradual increase in the sophistication of toxicological and immunologic methods of investigation. This concept, however, poses some complications. One of these is the proper issuing of certified copies of death certificates when the certificate is not complete. Another is the establishment of the maximum amount of time that may elapse between the time of the issue of the "pending" certificate and the final completion of the certificate. This time interval is established by statute in some jurisdictions, by custom or local arrangements in others. The medical-legal officer must operate within the legal limitations set in his or her area.

Because such cases should be held to a minimum, the following guidelines were recommended by the Subcommittee on the Medical Certification of Medicolegal Cases of the U.S. National Committee on Vital and Health Statistics (12).

1. The term "pending" is intended to apply only to cases in which there is a reasonable expectation that an autopsy, other diagnostic procedure, or investigation may significantly change the diagnosis.
2. Certifications of cause of death should not be deferred merely because "all details" of a case are not available. Thus, for example, if it is clear that a patient died of "cancer of the stomach," reporting of the cause should not be deferred while a determination of the histological type is being carried out. Similarly, if a death is from "influenza," there is no justification for delaying the certification because a virological test is being carried out.
3. In cases where death is known to be from an injury, but the circumstances surrounding the death are not yet established, the injury should be reported immediately. The circumstances of the injury should be noted as "pending investigation" and a supplemental report filed.
4. Lastly, the term "pending" is not intended to apply to cases in which the cause of death is in doubt and for which no further

diagnostic procedures can be carried out. In this case, the “probable” cause should be entered on the basis of the facts available and the certification made in accordance with the best judgment of the certifier.

The medical examiner or coroner must realize that when a death certificate is “pending,” the final settlement of burial expenses, insurance claims, veterans benefits, and so forth, is slowed. Indeed, many such matters will be held open until the certificate is properly completed. Therefore, the use of the term “pending investigation,” or similar deferring terms, should be avoided whenever possible.

Certifier section

The medical examiner or coroner certifies that “On the basis of examination and/or investigation, in my opinion, death occurred at the time, date, and place, and due to the cause(s) and manner as stated.”

45. CERTIFIER (Check only one): <input type="checkbox"/> Certifying physician - To the best of my knowledge, death occurred due to the cause(s) and manner stated. <input type="checkbox"/> Pronouncing & Certifying physician - To the best of my knowledge, death occurred at the time, date, and place, and due to the cause(s) and manner stated. <input type="checkbox"/> Medical Examiner/Coroner - On the basis of examination, and/or investigation, in my opinion, death occurred at the time, date, and place, and due to the cause(s) and manner stated. Signature of certifier: _____			
46. NAME, ADDRESS, AND ZIP CODE OF PERSON COMPLETING CAUSE OF DEATH (Item 32)			
47. TITLE OF CERTIFIER	48. LICENSE NUMBER	49. DATE CERTIFIED (Mo/Day/Yr)	50. FOR REGISTRAR ONLY- DATE FILED (Mo/Day/Yr)

The phrase “in my opinion” is included because it is recognized that in medical-legal cases, it is not always possible to make precise determinations of the date and the cause(s) of death. The date may be obscure in the case of bodies found some time after death occurred, and the relationship between the existing diseases or the sequence in which diseases or injuries occurred is not always clear.

However, except in unusual circumstances, the medical examiner or coroner is in a better position than any other individual to make a judgment as to which of the conditions led directly to death and to state the antecedent conditions, if any, that gave rise to this cause.

Space is provided for the time of death and for the date the decedent was pronounced dead. When the exact time of death is unknown, but there is sufficient basis for the medical examiner or coroner to render an opinion, the approximate time of death as estimated by the medical examiner or coroner will be given. This information should be entered as “APPROX—time.” Local time should be used, recording hours and minutes according to a 24-hour clock (for example, 0725).

The medical examiner or coroner signs the completed statement, adding his or her degree or title and license number. The date of certification and mailing address of the medical examiner or coroner should also be provided.

Examples of medical certification

This section contains several examples of medical certification for the guidance of the medical examiner or coroner.

Case No. 1

On January 2, 2003, a 21-year-old female was critically injured in an automobile accident and died from a fractured skull causing cerebral contusion soon after being brought to the hospital. Police records indicated she was the driver in a two-car collision that occurred at 2:15 a.m. at the corner of 21st Street and Ash Street. The decedent crossed the center line and struck an oncoming car head on. Autopsy showed injuries and blood ethanol of 0.240 grams percent.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the chain of events--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p>				
IMMEDIATE CAUSE (Final disease or condition resulting in death)		a. Cerebral contusion		30 minutes
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST		b. Fractured skull		30 minutes
		c. Blunt impact to head		30 minutes
		d. Collision of two motor vehicles		30 minutes
PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.			33. WAS AN AUTOPSY PERFORMED?	
Acute ethanol intoxication			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH?			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
35. DID TOBACCO USE CONTRIBUTE TO DEATH?	36. IF FEMALE:	37. MANNER OF DEATH		
<input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown	<input checked="" type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	<input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined		
38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)	39. TIME OF INJURY	40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)		41. INJURY AT WORK?
January 2, 2003	0215	City street		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
42. LOCATION OF INJURY: State: Nevada City or Town: Xylene				
Street & Number: 21 st and Ash Street		Apartment No.:		Zip Code: 89511-4444
43. DESCRIBE HOW INJURY OCCURRED:				44. IF TRANSPORTATION INJURY, SPECIFY:
Decedent unrestrained driver in an auto-auto collision. Decedent crossed line and hit oncoming vehicle head on.				<input checked="" type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)

Case No. 2

On May 15, 2003, a 49-year-old male gardener was brought to the emergency room with an infected wound of the right foot. Because of repeated convulsions, he was admitted to the hospital. The examining physician made a diagnosis of tetanus. His wife reported that while employed as a gardener on April 1, 2003, he stepped on a garden rake. He treated the laceration himself. Patient died of asphyxia during convulsions May 16, 2003. Autopsy supported diagnosis.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) → a. <u>Convulsions</u> Due to (or as a consequence of):</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p> <p>b. <u>Clostridium tetanus infection</u> Due to (or as a consequence of):</p> <p>c. <u>Infected puncture laceration of foot</u> Due to (or as a consequence of):</p> <p>d. _____</p>				<p>2 days</p> <p>6 weeks</p> <p>6 weeks</p>
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p> <p>April 1, 2003</p>	<p>39. TIME OF INJURY</p> <p>1500</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p> <p>Private yard</p>	<p>41. INJURY AT WORK? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>42. LOCATION OF INJURY: State: <u>Vermont</u> City or Town: <u>Lowell</u></p> <p>Street & Number: <u>221 Folk Avenue</u> Apartment No.: _____ Zip Code: <u>05847-3333</u></p>				
<p>43. DESCRIBE HOW INJURY OCCURRED:</p> <p>Stepped on rake while gardening in a residential yard</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify)</p>	

Case No. 3

On May 10, 2003, a 25-year-old male was admitted to the hospital with a gunshot wound to the head. He had been at home in his study cleaning his gun when the shot was fired at approximately 9 p.m. He died at 11:05 p.m. on the same day. Autopsy showed contact gunshot wound of right temple.

CAUSE OF DEATH (See instructions and examples)			
<p>32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) a. <u>Penetration brain injury</u> Due to (or as a consequence of):</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST b. <u>Gunshot wound to head</u> Due to (or as a consequence of):</p> <p>c. _____ Due to (or as a consequence of):</p> <p>d. _____</p>			<p>Approximate interval: Onset to death</p> <p><u>2 hours</u></p> <p><u>2 hours</u></p>
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input checked="" type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>	
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month) May 10, 2003</p>	<p>39. TIME OF INJURY 2100</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) Decedent's home</p>	<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
<p>42. LOCATION OF INJURY: State: Alabama Street & Number: 3129 Discus Avenue</p>			<p>City or Town: Columbus Apartment No.: Zip Code: 36102-8888</p>
<p>43. DESCRIBE HOW INJURY OCCURRED: Decedent cleaning gun had contact wound to right temple.</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)</p>

NOTE: Autopsy findings in this case indicate an intentionally inflicted gunshot wound rather than accidental discharge of a firearm.

Case No. 4

On June 21, 2003, a 39-year-old male had been in a powerboat that capsized after striking an underwater obstruction at about 2 p.m. The body was recovered 2 hours later by the water patrol. Blood alcohol was measured at 0.31 grams percent.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.				
IMMEDIATE CAUSE (Final disease or condition resulting in death) → a. <u>Asphyxia</u> Due to (or as a consequence of):				Unknown
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST c. _____ Due to (or as a consequence of):				Unknown
b. <u>Drowning</u> Due to (or as a consequence of):				
d. _____ Due to (or as a consequence of):				
PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.				
Alcohol intoxication at 0.31 grams percent				
33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined		
38. DATE OF INJURY (Mo/Day/Yr) (Spell Month) June 21, 2003	39. TIME OF INJURY 1400	40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) Public lake	41. INJURY AT WORK? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
42. LOCATION OF INJURY: State: Idaho City or Town: Elkton				
Street & Number: Lake Tarpon		Apartment No.:		Zip Code: 83722
43. DESCRIBE HOW INJURY OCCURRED: Boat operator fell in lake from powerboat when it hit underwater obstruction				44. IF TRANSPORTATION INJURY, SPECIFY: <input checked="" type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)

Case No. 5

On January 12, 2003, a 2-year-old female was admitted to the hospital with salicylate poisoning. She had been under treatment for tonsillitis and upper respiratory infection. She had been given multiple excessive doses of aspirin (adult rather than baby tablets). She died on January 13, 2003.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
32. PART I. Enter the chain of events--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.				
IMMEDIATE CAUSE (Final disease or condition resulting in death)				
a. <u>Acute salicylate poisoning</u>				<u>23 hours</u>
Due to (or as a consequence of):				
b. <u>Overdose of aspirin</u>				<u>23 hours</u>
Due to (or as a consequence of):				
c. <u>Treatment for acute tonsillitis</u>				<u>2 days</u>
Due to (or as a consequence of):				
UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST				
PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.				
Upper respiratory infection				
33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown		36. IF FEMALE: <input checked="" type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year		37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined
38. DATE OF INJURY (Mo/Day/Yr) (Spell Month) January 12, 2003	39. TIME OF INJURY 0705	40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) Own home		41. INJURY AT WORK? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
42. LOCATION OF INJURY: State: Oregon City or Town: New Haven				
Street & Number: 2139 Carlton Avenue Apartment No.: 12 Zip Code: 97323-9999				
43. DESCRIBE HOW INJURY OCCURRED: Overdose of aspirin given				44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)

Case No. 6

On May 5, 2003, a 54-year-old male was found dead from carbon monoxide poisoning in an automobile in a closed garage. A hose, running into the passenger compartment of the car, was attached to the exhaust pipe. The deceased had been despondent for some time as a result of a malignancy, and letters found in the car indicated intent to take his own life.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) -----> a. <u>Carbon monoxide poisoning</u> Due to (or as a consequence of):</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p> <p>b. <u>Inhaled auto fumes</u> Due to (or as a consequence of):</p> <p>c. _____ Due to (or as a consequence of):</p> <p>d. _____</p>				<p>Unknown</p> <p>Unknown</p>
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p> <p>Cancer of stomach</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown</p>	<p>36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input checked="" type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month) May 5, 2003</p>	<p>39. TIME OF INJURY Unknown</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) Own home garage</p>	<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>	
<p>42. LOCATION OF INJURY: State: Missouri City or Town: Alexandria Street & Number: 898 Sylvan Road Apartment No.: Zip Code: 65100-1234</p>				
<p>43. DESCRIBE HOW INJURY OCCURRED: Inhaled carbon monoxide from auto exhaust through hose in an enclosed garage</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)</p>	

Case No. 7

A 32-year-old male was admitted to the hospital on August 23, 2003, with several stab wounds. He had been found in an alley off Smith Street at 4 a.m. by the police. No weapon was discovered. He died at 6:30 p.m. on the same day. Autopsy revealed that the intrathoracic hemorrhage due to the stab wound of the lung could be considered fatal.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
32. PART I. Enter the chain of events--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.				
IMMEDIATE CAUSE (Final disease or condition resulting in death)		a. <u>Intrathoracic hemorrhage</u> Due to (or as a consequence of):		<u>15 hours</u>
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST		b. <u>Stab wound of lung</u> Due to (or as a consequence of):		<u>15 hours</u>
		c. _____ Due to (or as a consequence of):		
		d. _____ Due to (or as a consequence of):		
PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.				33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Several stab wounds of abdomen and extremities				34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH <input type="checkbox"/> Natural <input checked="" type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined		
38. DATE OF INJURY (Mo/DaY/Yr) (Spell Month) August 23, 2003	39. TIME OF INJURY 0330	40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) Alley	41. INJURY AT WORK? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
42. LOCATION OF INJURY: State: Maryland City or Town: Davidsonville				
Street & Number: Alley between 331 and 333 Smith Street Apartment No.: Zip Code: 21035-3333				
43. DESCRIBE HOW INJURY OCCURRED: Stabbed by a sharp instrument			44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)	

Case No. 8

On July 4, 2003, a 56-year-old male was found dead in a hotel. Autopsy revealed no anatomic cause of death. Blood alcohol level was 0.450 grams percent.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) → a. <u>Acute alcohol poisoning</u> Due to (or as a consequence of):</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p> <p>b. _____ Due to (or as a consequence of):</p> <p>c. _____ Due to (or as a consequence of):</p> <p>d. _____</p>				<p><u>Unknown</u></p>
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p> <p>Alcoholic cirrhosis</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month) July 4, 2003</p>	<p>39. TIME OF INJURY Unknown</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) In bed in a hotel room</p>	<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>	
<p>42. LOCATION OF INJURY: State: <u>Hawaii</u> City or Town: <u>Haiku</u> Street & Number: <u>666 Beach Highway</u> Apartment No.: <u>301</u> Zip Code: <u>96899</u></p>				
<p>43. DESCRIBE HOW INJURY OCCURRED: Over ingested ethanolic beverages. Decedent's blood alcohol level was 0.450 grams percent.</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)</p>	

Case No. 9

On March 18, 2003, a 2-month-old male was found dead in his crib. There was no previous illness, and, although autopsy revealed congestion of the lungs, the medical examiner determined that this did not cause the death. Because no other condition could be found that could have led to the death of the infant, the cause of death was determined to be sudden infant death syndrome.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the <u>chain of events</u>—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)</p> <p>a. <u>Sudden infant death syndrome</u> Due to (or as a consequence of):</p> <p>b. _____ Due to (or as a consequence of):</p> <p>c. _____ Due to (or as a consequence of):</p> <p>d. _____ Due to (or as a consequence of):</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p>				<p>Unknown</p>
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input type="checkbox"/> Accident <input type="checkbox"/> Pending investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr (Spell Month))</p>	<p>39. TIME OF INJURY</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p>		<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>42. LOCATION OF INJURY: State: _____ City or Town: _____</p> <p>Street & Number: _____ Apartment No.: _____ Zip Code: _____</p>				
<p>43. DESCRIBE HOW INJURY OCCURRED:</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify)</p>	

NOTE: There are established protocols for investigating possible SIDS deaths and criteria for distinguishing between SIDS, consistent with SIDS, and unexpected and undetermined causes. This will be discussed in greater detail in a later section.

Case No. 10

On August 18, 2003, a 32-year-old female was found dead at home. Initial investigation did not reveal cause of death; neither did autopsy or toxicological examination.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) a. <u>Cause of death not determined upon autopsy and toxicologic examination</u> Due to (or as a consequence of):</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST b. _____ Due to (or as a consequence of):</p> <p>c. _____ Due to (or as a consequence of):</p> <p>d. _____</p>				<p><u>Unknown</u></p>
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	
			<p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown</p>	<p>36. IF FEMALE: <input checked="" type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input checked="" type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p>	<p>39. TIME OF INJURY</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p>	<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>42. LOCATION OF INJURY: State: _____ City or Town: _____ Street & Number: _____ Apartment No.: _____ Zip Code: _____</p>				
<p>43. DESCRIBE HOW INJURY OCCURRED:</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)</p>	

NOTE: This example is one way in which the medical-legal officer, after reasonable investigation, can indicate that the cause has not been determined. Presumably, such a death certificate would have been initially issued with the term "Pending Investigation" checked in item 37 and, at a later time, the phrase "Could not be determined" substituted.

Case No. 11

On September 4, 2003, a 50-year-old alcoholic male was found unconscious in an abandoned house at 4 a.m. by police. He was admitted to the hospital where he died at 10 a.m. on the same day. Examination on admission to the hospital revealed a large subdural hematoma causing intracerebral hemorrhage. There was a large subgaleal hemorrhage over the area of the subdural hematoma.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) a. <u>Subdural hematoma</u></p> <p>Due to (or as a consequence of):</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST b. <u>Blunt force impact to head</u></p> <p>Due to (or as a consequence of):</p> <p>c. _____</p> <p>Due to (or as a consequence of):</p> <p>d. _____</p>				<p>Unknown</p> <p>Unknown</p>
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p>				<p>33. WAS AN AUTOPSY PERFORMED?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input type="checkbox"/> Accident <input checked="" type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p> <p>September 4, 2003</p>	<p>39. TIME OF INJURY</p> <p>Unknown</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p> <p>Abandoned house</p>	<p>41. INJURY AT WORK?</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>	
<p>42. LOCATION OF INJURY: State: <u>Florida</u> City or Town: <u>Miami</u></p> <p>Street & Number: <u>3131 Smith Street</u> Apartment No.: _____ Zip Code: <u>33109-1233</u></p>				
<p>43. DESCRIBE HOW INJURY OCCURRED:</p> <p>Unknown</p>				<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify)</p>

NOTE: The above certificate was issued before police investigation was completed. After a thorough investigation, the legal-medical officer made the judgment that the decedent probably fell down the stairs next to which the body was found. The certificate should be amended in item 37 to "Accident."

CAUSE OF DEATH (See instructions and examples)			
<p>32. PART I. Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) → a. <u>Subdural hematoma</u> Due to (or as a consequence of): _____</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST b. <u>Blunt force injury to top of head</u> Due to (or as a consequence of): _____</p> <p>c. <u>Probable fall</u> Due to (or as a consequence of): _____</p> <p>d. _____</p>			<p>Approximate interval: Onset to death</p> <p>_____</p> <p>Unknown</p> <p>_____</p> <p>Unknown</p> <p>_____</p> <p>Unknown</p> <p>_____</p>
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p>			<p>33. WAS AN AUTOPSY PERFORMED?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>			<p>36. IF FEMALE:</p> <p><input checked="" type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p> <p>September 4, 2003</p>			<p>39. TIME OF INJURY</p> <p>Unknown</p>
<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p> <p>Abandoned house</p>			<p>41. INJURY AT WORK?</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
<p>42. LOCATION OF INJURY: State: <u>Florida</u> City or Town: <u>Miami</u></p> <p>Street & Number: <u>3131 Smith Street</u> Apartment No.: _____ Zip Code: <u>33109-1233</u></p>			
<p>43. DESCRIBE HOW INJURY OCCURRED:</p> <p>Decedent probably fell down stairs in abandoned house</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify)</p>

Case No. 12

On March 4, 2003, a 40-year-old male collapsed at a swimming pool. He had no history of heart problems but had complained 2 days earlier of chest pains and indigestion. Autopsy revealed an acute myocardial infarction due to severe coronary artery disease. The serum was milky. A family history of hyperlipidemia was identified.

<p align="center">CAUSE OF DEATH (See instructions and examples)</p> <p>32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition ----- resulting in death)</p> <p>a. <u>Acute myocardial infarction</u> Due to (or as a consequence of): _____</p> <p>b. <u>Severe coronary artery disease</u> Due to (or as a consequence of): _____</p> <p>c. _____ Due to (or as a consequence of): _____</p> <p>d. _____</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST</p>		<p>Approximate interval: Onset to death _____ minutes _____ hours _____ days _____ weeks _____ months _____ years _____</p>	
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p> <p>Family hyperlipidemia</p>		<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>	
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p>	<p>39. TIME OF INJURY</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p>	<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>42. LOCATION OF INJURY: State: _____ City or Town: _____ Street & Number: _____ Apartment No.: _____ Zip Code: _____</p>		<p>43. DESCRIBE HOW INJURY OCCURRED:</p>	
<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify) _____</p>			

Case No. 13

On July 26, 2003, a 32-year-old male was found along a roadway lying in some brambles. He was thrashing about and grinding his teeth. His body temperature was 103° F. He steadily went into full arrest and later died in the emergency room at a medical center. He had a history of cocaine and cannabis abuse. Toxicological examination revealed that he died of cocaine toxicity.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) → a. <u>Agitated delirium</u> Due to (or as a consequence of):</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST.</p> <p>b. <u>Cocaine toxicity with cocaine level of 2150 nanograms per milliliter</u> Due to (or as a consequence of):</p> <p>c. _____ Due to (or as a consequence of):</p> <p>d. _____</p>				<p>_____ minutes</p> <p>_____ minutes</p> <p>_____ minutes</p>
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p> <p>History of cocaine and cannabis abuse</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)</p> <p>July 26, 2003</p>	<p>39. TIME OF INJURY</p> <p>Unknown evening</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area)</p> <p>Unknown</p>	<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>	
<p>42. LOCATION OF INJURY: State: Illinois City or Town: Morton</p> <p>Street & Number: Elm Street Apartment No.: Zip Code: 61550</p>				
<p>43. DESCRIBE HOW INJURY OCCURRED:</p> <p>When found, the decedent was experiencing an adverse reaction to cocaine. Decedent had a history of substance abuse.</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify)</p>	

Case No. 14

On October 1, 2003, at 2:30 p.m., a 22-year-old male was found hanging by the neck in the garage at the rear of his residence. He had a history of despondency and drug abuse and was last seen by his mother 30 minutes earlier.

CAUSE OF DEATH (See instructions and examples)				Approximate interval: Onset to death
<p>32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) a. <u>Asphyxia</u> Due to (or as a consequence of): _____</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST b. <u>Hanging by the neck</u> Due to (or as a consequence of): _____</p> <p>c. _____ Due to (or as a consequence of): _____</p> <p>d. _____</p>				<p>_____ minutes</p> <p>_____ minutes</p>
<p>PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.</p> <p>Substance abuse, depression</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input checked="" type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>		
<p>38. DATE OF INJURY (Mo/Day/Yr) (Spell Month) October 1, 2003</p>	<p>39. TIME OF INJURY 1430</p>	<p>40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) Garage at decedent's home</p>		<p>41. INJURY AT WORK? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
<p>42. LOCATION OF INJURY: State: <u>Kansas</u> City or Town: <u>Wichita</u></p> <p>Street & Number: <u>217 Kirk Avenue</u> Apartment No.: _____ Zip Code: <u>67204-6666</u></p>				
<p>43. DESCRIBE HOW INJURY OCCURRED: Hanging by rope from rafters</p>			<p>44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify)</p>	

Common problems in death certification

Often several acceptable ways of writing a cause-of-death statement exist. Optimally, a certifier will be able to provide a simple description of the process leading to death that is etiologically clear and be confident that this is the correct sequence of causes. However, realistically, description of the process is sometimes difficult because the certifier is **not certain**.

In this case, the certifier should think through the causes about which he/she is confident and what possible etiologies could have resulted in these conditions. The certifier should select the causes that are suspected to have been involved and use words such as “probable” or “presumed” to indicate that the description provided is not completely certain. If the initiating condition reported on the death certificate could have arisen from a pre-existing condition but the certifier cannot determine the etiology, he/she should state that the etiology is unknown, undetermined, or unspecified, so it is clear that the certifier did not have enough information to provide even a qualified etiology. Reporting a cause of death as unknown should be a last resort.

The **elderly decedent** should have a clear and distinct etiological sequence for cause of death, if possible. Terms such as senescence, infirmity, old age, and advanced age have little value for public health or medical research. Age is recorded elsewhere on the certificate. When a number of conditions resulted in death, the medical examiner or coroner should choose the single sequence that, in his or her opinion, best describes the process leading to death, and place any other pertinent conditions in Part II. “Multiple system failure” could be included in Part II, but the systems need to be specified to ensure that the information is captured.

The **infant decedent** should have a clear and distinct etiological sequence for cause of death, if possible. “Prematurity” should not be entered without explaining the etiology of prematurity. Maternal conditions may have initiated or affected the sequence that resulted in infant death, and such maternal causes should be reported in addition to the infant causes on the infant’s death certificate (e.g., Hyaline membrane disease **due to** prematurity, 28 weeks **due to** placental abruption **due to** blunt trauma to mother’s abdomen).

When **SIDS** is suspected, a complete investigation should be conducted, typically by a medical examiner or coroner. Issues relating to pathology, role of injury, and concern about forms of abuse have influenced certification practices for SIDS and other deaths for which cause is difficult to determine (9).

Protocols exist for determining if an infant death under 1 year of age is a SIDS death including thorough scene investigation, review of clinical history, and a complete autopsy (9,13). The investigation results usually fit within one of the following (9):

- Disease or injury—Investigation identifies a cause of death such as pneumonia, meningitis, overlaying, head trauma, asphyxia from plastic bag, or other cause. The disease condition or conditions should be reported on the death certificate.
- Sudden Infant Death Syndrome—Investigation finds no reason to question the preliminary diagnosis of SIDS. That is, toxicology tests and histology are negative, there are no unusual scene findings or sleeping conditions, there is no medical/clinical history that would predispose the baby to die, and the autopsy did not reveal any other explanation.
- Consistent with Sudden Infant Death Syndrome but with disease condition—Investigation results are consistent with a diagnosis of SIDS; however, a disease or other condition (e.g., focal bronchiolitis) is identified. If the role of the condition in causing or contributing to death is not known or is difficult to ascertain, this finding would not preclude reporting “Consistent with Sudden Infant Death Syndrome” in Part I and the disease conditions in Part II of the death certificate.
- Consistent with Sudden Infant Death Syndrome but risk factor exists—Investigation results are consistent with a diagnosis of SIDS; however, a risk factor or external condition (e.g., bed sharing or sleeping on a soft pillow) is identified. If the role of the external condition or risk factor in causing or contributing to death is not known or is difficult to prove, this finding would not preclude reporting “Consistent with Sudden Infant Death Syndrome” in Part I and the risk factor or external conditions in Part II of the death certificate.
- Unexpected and undetermined cause—Investigation results rule out Sudden Infant Death Syndrome but the cause is not determined. Other possible findings that are found but for which the role is unclear may be reported in Part II.

Most certifiers will find themselves, at some point, in the circumstance in which they are **unable to provide a simple description of the process of death**. In this situation, the certifier should try to provide a clear sequence, qualify the causes about which he/she is uncertain, and be able to explain the certification chosen.

When processes such as the following are reported, additional information about the etiology should be reported:

Abscess	Cellulitis	Gastrointestinal	Pancytopenia
Abdominal hemorrhage	Cerebral edema	hemorrhage	Paralysis
Adhesions	Cerebrovascular accident	Heart failure	Perforated gallbladder
Adult respiratory distress syndrome	Cerebellar tonsillar herniation	Hemothorax	Peritonitis
Acute myocardial infarction	Chronic bedridden state	Hepatic failure	Pleural effusions
Altered mental status	Cirrhosis	Hepatitis	Pneumonia
Anemia	Coagulopathy	Hepatorenal syndrome	Pulmonary arrest
Anoxia	Compression fracture	Hyperglycemia	Pulmonary edema
Anoxic encephalopathy	Congestive heart failure	Hyperkalemia	Pulmonary embolism
Arrhythmia	Convulsions	Hypovolemic shock	Pulmonary insufficiency
Ascites	Decubiti	Hyponatremia	Renal failure
Aspiration	Dehydration	Hypotension	Respiratory arrest
Atrial fibrillation	Dementia (when not otherwise specified)	Immunosuppression	Seizures
Bacteremia	Diarrhea	Increased intracranial pressure	Sepsis
Bedridden	Disseminated intravascular coagulopathy	Intracranial hemorrhage	Septic shock
Biliary obstruction	Dysrhythmia	Malnutrition	Shock
Bowel obstruction	End-stage liver disease	Metabolic encephalopathy	Starvation
Brain injury	End-stage renal disease	Multi-organ failure	Subarachnoid hemorrhage
Brain stem herniation	Epidural hematoma	Multi-system organ failure	Subdural hematoma
Carcinogenesis	Exsanguination	Myocardial infarction	Sudden death
Carcinomatosis	Failure to thrive	Necrotizing soft-tissue infection	Thrombocytopenia
Cardiac arrest	Fracture	Old age	Uncal herniation
Cardiac dysrhythmia	Gangrene	Open (or closed) head injury	Urinary tract infection
Cardiomyopathy			Ventricular fibrillation
Cardiopulmonary arrest			Ventricular tachycardia
			Volume depletion

If the certifier is unable to determine the etiology of a process such as those shown above, the process must be qualified as being of an unknown, undetermined, probable, presumed, or unspecified etiology so it is clear that a distinct etiology was not inadvertently or carelessly omitted.

The following conditions and types of death might seem to be specific or natural, but when the medical history is examined further, may be found to be complications of an injury or poisoning (possibly occurring long ago):

Asphyxia	Epidural hematoma	Hyperthermia	Sepsis
Bolus	Exsanguination	Hypothermia	Subarachnoid hemorrhage
Choking	Fall	Open reduction of fracture	Subdural hematoma
Drug or alcohol overdose/drug or alcohol abuse	Fracture	Pulmonary emboli	Surgery
	Hip fracture	Seizure disorder	Thermal burns/chemical burns

Additional resources

In addition to the series of handbooks, additional resources include manuals, guidelines, and Web sites (5,7,8,14–20). Resources on completing death certificates should be kept with or near blank death certificates for easy reference. Additional copies of government-produced resources are available from the State vital statistics offices, the National Center for Health Statistics (8,14–16), and the Internet at <http://www.cdc.gov/nchs> (look under vital statistics, mortality, writing cause-of-death statements).

Several resources (5,7) are available for purchase from the College of American Pathologists. These resources have more examples of cause-of-death certification and address some situations such as peri-procedural deaths that are not as straightforward as many deaths.

Completing Other Items on the Death Certificate

These instructions pertain to the 2003 revision of the U.S. Standard Certificate of Death. Usually the funeral director completes items 1–23 and 51–55. Another physician may have completed some of the medical items, but under certain circumstances the medical examiner or coroner may be responsible for completing the entire certificate. Therefore, instructions for completing all items on the certificate are included.

NAME OF DECEDENT: For use by physician or institution

The left-hand margin of the certificate contains a line where the physician or hospital can write in the name of the decedent. This allows the hospital to assist in completing the death certificate before the body is removed by the funeral director. However, because the funeral director is responsible for completing the personal information about the decedent and because the hospital frequently does not have the complete legal name of the decedent, the hospital or physician should enter the name they have for the decedent in this item, and the funeral director will then enter the full legal name in item 1.

1. DECEDENT'S LEGAL NAME (Include AKAs if any)(First, Middle, Last)

Enter the full first, middle, and last names of the decedent. Do not abbreviate. Do not copy any name from the left-hand margin of the certificate into item 1 on the certificate; the name in the margin may be incomplete or incorrect.

It is suggested that the medical examiner or coroner print the name as provided to him or her by the informant and have the informant check the spelling and order of names before entering the name on the certificate.

If there appears to be more than one spelling of any name provided, and the correct spelling cannot be verified, use the most common spelling. The name must consist of English alphabetic characters and punctuation marks.

If the medical examiner or coroner cannot determine the name of a found body, enter “Unknown” in the name field. Do not enter names such as “John Doe” or “Jane Doe.”

Multiple first or middle names

If the informant indicates two first names separated by a space, such as “Mary Louise Carter,” verify that “Louise” is part of the first name and is not a middle name. Enter the two first names with a blank space between them. If several middle names are given, enter all with a space between the names.

Initials

If the informant indicates that the person uses a first initial such as “E. Charles Jones,” try to obtain the whole first name.

If the first name can be obtained, enter the whole first name. If not, enter just the initial followed by a period.

If the informant indicates two initials and a surname such as “H.S. Green,” determine if these are a first and middle initial, or two first initials with no middle name or initial. Try to obtain the whole name(s).

If the names can be obtained, enter the whole names in the appropriate spaces. If there are no whole names, then enter the initials in the appropriate spaces. Each initial should be followed by a period.

Religious names and titles

If there is a title preceding the name, such as “Doctor,” do not enter the title in any of the name fields.

For religious names such as “Sister Mary Lawrence,” enter “Sister Mary” in the first name field.

No first or middle names (infants)

If a name such as “Baby Boy Watts” is obtained from medical records for the death of a newborn, check with the parents or other informant to see if the child had a given name.

If the child had not been given a name, leave the first and middle name fields blank and enter only the surname.

Alias(es)

Complete the current legal name before entering any other names (**alias** or AKA, “also known as,” names such as AKA Smith) the decedent used or was known as. The alias should be listed if it is substantially different from the decedent’s legal name (e.g., Samuel Langhorne Clemens AKA Mark Twain, but not Jonathon Doe AKA John Doe). Record the alias name with AKA preceding the name (e.g., AKA Smith). Repeat until there are no other names provided.

The State may enter the full alias rather than just the part of the name that differs from the legal name.

AKA does not include:

- Nicknames, unless used for legal purposes or at the family’s request
- Spelling variations of the first name
- Presence or absence of middle initial
- Presence or absence of punctuation marks or spaces
- Variations in spelling of common elements of the surname, such as “Mc” and “Mac” or “St.” and “Saint”

This item is used to identify the decedent. This is the most important item on the certificate for legal and personal use by the family. There are alternate spellings to many names, and it is critical for the family to have the name spelled correctly.

2. SEX

Enter male or female based on observation. Do not abbreviate or use other symbols. If sex cannot be determined after verification with medical records, inspection of the body, or other sources, enter “Unknown.” Do not leave this item blank.

This item aids in the identification of the decedent. It is also used in research and statistical analysis to determine sex-specific death rates.

3. SOCIAL SECURITY NUMBER (SSN)

Enter the decedent’s 9-digit **social security number** (SSN). Read the number back to the informant or check against the document from which it is being copied before moving to the next item.

If the informant does not know the decedent's SSN at the time of the interview, leave the item blank until the informant can supply the number.

If the decedent has no social security number, for example, a recent immigrant or a person from a foreign country visiting the United States, enter "None."

If the deceased's social security number is not known, enter "Unknown."

If the decedent's SSN is not obtainable, enter "Not Obtainable."

This item is useful in identifying the decedent and facilitates the filing of social security claims.

4a-c. AGE

Make one entry only in either 4a, 4b, or 4c depending on the age of the decedent.

4a. AGE—Last Birthday (Years)

Enter the decedent's exact age in years at his or her last birthday.

If the decedent was under 1 year of age, leave this item blank.

Drop all fractions, such as "75 and a half years"; record as "75."

For responses such as "about 90 years," enter "90" in the Years box.

4b. UNDER 1 YEAR—Months, Days

Enter the exact age in either months or days at time of death for infants surviving at least 1 month.

If the infant was 1–11 months of age inclusive, enter the age in completed months.

If the infant was less than 1 month old, enter the age in completed days.

If the infant was over 1 year or under 1 day of age, leave this item blank.

For responses such as "almost 4 months," enter "3" in the Months box.

4c. UNDER 1 DAY—Hours, Minutes

Enter the exact number of hours or minutes the infant lived for infants who did not survive for an entire day.

If the infant lived 1–23 hours inclusive, enter the age in completed hours.

If the infant was less than 1 hour old, enter the age in minutes.

If the infant was more than 1 day old, leave this item blank.

If the informant gives an unspecified answer such as several hours or a few minutes, ASK—Can you give me a number? If a range is given, use the lower number. If the informant cannot give a number, be sure to identify the units, if possible, by entering a “?” in the appropriate unit box.

If the informant does not know and cannot obtain the age, record “Unknown” in box 4a.

Information from this item is used to study differences in age-specific mortality and in planning and evaluating public health programs.

5. DATE OF BIRTH (Month, Day, Year)

Enter the full name of the month (January, February, March, etc.), day, and 4-digit year that decedent was born. Do not use a number or abbreviation to designate the month.

If the date of birth is unknown, then enter “Unknown.” If part of date of birth is unknown, then enter the known parts and leave the remaining parts blank.

For example, for a person who is born in 1913, but the month and day are not known, enter 1913. If the month and year are known and the day is not known, enter February, “blank,” 1913.

This item is useful in identification of the decedent for legal purposes. It also helps verify the accuracy of the “age” item.

6. BIRTHPLACE (City and State or Foreign Country)

If the decedent was born in the United States, enter the name of the city and State.

(NOTE: Canadian provinces and Canadian territories are not collected for decedent’s place of birth.)

If the decedent was not born in the United States, enter the name of the country of birth whether or not the decedent was a U.S. citizen at the time of death.

If the decedent was born in the United States but the city is unknown, enter the name of the State only. If the State is unknown, enter "U.S.—unknown."

If the decedent was born in a foreign country but the country is unknown, enter "Foreign—unknown."

If no information is available regarding place of birth, enter "Unknown."

This item is used to match birth and death certificates of a deceased individual. Matching these records provides information from the birth certificate that is not contained on the death certificate and may give insight into which conditions led to death. Information from the birth certificate is especially important in examining the causes of infant mortality.

7a–g Residence of Decedent

The residence of the decedent (State, county, city, and street address) is the place where his or her household is located, the place where the decedent actually resided, or where the person lives and sleeps most of the time. This is not necessarily the same as "home State," "voting residence," "mailing address," or "legal residence."

Do not enter addresses that are post office boxes or rural route numbers. Get the building number and "street" name for the residence address rather than the postal address.

Temporary residence

Never enter a temporary residence, such as one used during a visit, business trip, or a vacation. However, usual onshore place of residence during a tour of military duty is not considered temporary and should be entered as the place of residence on the certificate. Similarly, usual place of residence during attendance at college is not considered temporary and should be entered as the place of residence on the certificate.

Multiple residences

If the decedent lived in more than one residence (parent living in a child's household, children in joint custody, person owning more than one residence, or commuters living elsewhere while working), enter the residence lived in most of the year. If a child lives an equal amount of time in each residence, report the residence staying at when death occurred.

Institutions or group homes

If a decedent had been living in a facility where an individual usually resides for a long period of time, such as a group home, mental institution, nursing home, penitentiary, hospital for the chronically ill, long-term care facility, congregate care facility, foster home, or board and care home, this facility should be entered as the place of residence in items 7a through 7g.

Children

If the decedent was a child, residence is the same as that of the parent(s), legal guardian, or custodian unless the child was living in an institution where individuals usually reside for long periods of time, as indicated above. In those instances the residence of the child is shown as the facility. Children residing at a boarding school are considered to live at a parent's residence. Residence for foster children is the place they live most of the time.

Infants

If the decedent was an infant who never resided at home, the place of residence is that of the mother or legal guardian. Do not use an acute care hospital as the place of residence for any infant.

7a. RESIDENCE—STATE

Enter the name of the State in which the decedent lived. This may differ from the State in the mailing address. If the decedent was not a resident of the United States, enter the name of the country and the name of the unit of government that is the nearest equivalent of a State.

This item is where the U.S. States and territories and the Canadian provinces are recorded.

If a Canadian province or territory, enter the name of the province or territory followed by “/ Canada.” If resident of any other country, enter the name of the country in the space for State.

If the decedent's residence is unknown, enter “Unknown.”

7b. RESIDENCE—COUNTY

Enter the name of the county in which the decedent lived.

If the decedent resided in any country other than the United States and its territories, leave this item blank.

7c. RESIDENCE—CITY OR TOWN

Enter the name of the city, town, or location in which the decedent lived. This may differ from the city, town, or location used in the mailing address.

7d. RESIDENCE—STREET AND NUMBER

Enter the number and street name of the place where the decedent lived.

If the “street” name has a direction as a prefix, enter the prefix in front of the street name. If the “street name” has a direction after the name, enter the direction after the name (e.g., South Main Street or Florida Avenue NW). Report the “street” designator (Street, Road, Avenue, Court, etc.).

Enter the building number assigned to the decedent’s residence. If the number is unknown, enter “Unknown.”

7e. RESIDENCE—APARTMENT NUMBER

Enter the apartment or room number associated with the residence.

If there is no apartment or room number associated with this residence, leave the item blank.

7f. RESIDENCE—ZIP CODE

Enter the ZIP Code of the place where the decedent lived. This may differ from the ZIP Code used in the mailing address.

The 9-digit ZIP Code is preferred over the 5-digit ZIP Code. If only the 5-digit ZIP code is known, report that.

If the decedent was not a resident of the United States or its territories, leave this item blank.

7g. RESIDENCE—INSIDE CITY LIMITS?

Enter “Yes” if the location entered in 7c is incorporated and if the decedent’s residence is inside its boundaries. Otherwise enter “No.”

If it is not known if the residence is inside the city or town limits, enter “Unknown” in the space.

Mortality data by residence are used with population data to compute death rates for detailed geographic areas. These data are important in environmental studies. Data on deaths by place of residence of the decedent are

also used to prepare population estimates and projections. Local officials use this information to evaluate the availability and use of services in their area. Information on residence inside city limits is used to properly assign events within a county. Information on ZIP Code and whether the decedent lived inside city limits is valuable for studies of deaths for small areas.

8. EVER IN U.S. ARMED FORCES?

If the decedent ever served in the U.S. Armed Forces, enter "Yes." If not, enter "No." If the medical examiner or coroner cannot determine whether the decedent served in the U.S. Armed Forces, enter "Unknown." Do not leave this item blank.

This item is used to identify decedents who were veterans. This information is of interest to veteran groups.

9. MARITAL STATUS AT TIME OF DEATH

Enter the marital status of the decedent at time of death. Specify one of the following: Married; Married, but separated; Never married; Widowed; or Divorced. Just because a spouse may be the informant does not preclude the possibility of "Married, but separated." A person is legally married even if separated. A person is no longer legally married when the divorce papers are signed by a judge.

- "Annulled and not remarried" and "never previously married" are considered "Never Married."
- "Annulled and not remarried" and "married previously" are classified as how the previous marriage terminated (Widowed, Divorced).
- "Common Law marriage" is considered "Married."
- "Indian marriage" is considered "Married."

If marital status cannot be determined, enter "Unknown." Do not leave this item blank.

This information is used in determining differences in mortality by marital status.

10. SURVIVING SPOUSE'S NAME (If wife, give name prior to first marriage)

If the decedent was married at the time of death, enter the full name of the surviving spouse.

If the surviving spouse is the wife, enter her name prior to first marriage (e.g., maiden name).

This item is used in genealogical studies and in establishing proper insurance settlements and other survivor benefits.

11 and 12 PARENTS

11. FATHER'S NAME (First, Middle, Last)

Enter the first, middle, and last name of the father of the decedent.

It is suggested that the medical examiner or coroner print the name as provided to him or her by the informant and have the informant check the spelling before entering the name on the certificate.

If there appears to be more than one spelling of any name provided, and the correct spelling cannot be verified, use the most common spelling. The name must consist of English alphabetic characters and punctuation marks.

If the father's name cannot be determined, enter "Unknown" in the name field.

12. MOTHER'S NAME PRIOR TO FIRST MARRIAGE (First, Middle, Last)

Enter the name (first, middle, and surname) of the mother of the decedent used prior to first marriage, commonly known as the maiden name. This is the name given at birth or adoption, not a name acquired by marriage. This name is useful because it remains constant throughout life.

The names of the decedent's mother and father aid in identification of the decedent's record. The mother's name prior to first marriage or maiden surname is important for matching the record with other records because it remains constant throughout a lifetime in contrast to other names which may change because of marriage or divorce. These items are also of importance in genealogical studies.

13a-c INFORMANT

13a. INFORMANT'S NAME

Enter the name of the person who supplied the personal facts about the decedent and his or her family.

13b. RELATIONSHIP TO DECEDENT

Enter the relationship of the informant to the decedent. For example, this may be a husband, wife, parent, son, daughter, brother, sister, or friend.

13c. MAILING ADDRESS (Street and Number, City, State, ZIP Code)

Enter the complete mailing address of the informant whose name appears in item 13a. Be sure to include the ZIP Code.

The name and mailing address of the informant are used to contact the informant when inquiries must be made to correct or complete any items on the death certificate.

14. PLACE OF DEATH (Check only one; see instructions)

14. PLACE OF DEATH (Check only one; see instructions)	
IF DEATH OCCURRED IN A HOSPITAL:	IF DEATH OCCURRED SOMEWHERE OTHER THAN A HOSPITAL:
<input type="checkbox"/> Inpatient <input type="checkbox"/> Emergency Room/Outpatient <input type="checkbox"/> Dead on Arrival	<input type="checkbox"/> Hospice facility <input type="checkbox"/> Nursing home/Long term care facility <input type="checkbox"/> Decedent's home <input type="checkbox"/> Other (Specify):

Check the type of place where the decedent was pronounced dead.

Hospital deaths

If the decedent was pronounced dead in a hospital, check the box indicating the decedent's status at the hospital: Inpatient, Emergency Room/Outpatient (ER), or Dead on Arrival (DOA). Hospitals are licensed institutions with medical staff providing diagnostic and therapeutic services to patients.

Nonhospital deaths

If the decedent was pronounced dead somewhere else, check the box indicating whether pronouncement occurred at a Hospice facility, Nursing home/Long term care facility, Decedent's home, or Other location.

Hospice facility refers to a licensed institution providing hospice care (e.g., palliative and supportive care for the dying), not to hospice care that might be provided in a number of different settings, including a patient's home.

If death was pronounced at a licensed long-term care facility, check the "Nursing home/Long term care facility" box. A long-term care facility is not a hospital, but provides patient care beyond custodial care (e.g., nursing home, skilled nursing facility, long-term care facilities, convalescent care facility, extended care facility, intermediate care facility, residential care facility, congregate care facility).

If death was pronounced in the decedent's home, check the box that indicates decedent's home. A decedent's home includes independent living units such as private homes, apartments, bungalows, and cottages.

If death was pronounced at a licensed ambulatory/surgical center, orphanage, prison ward, public building, birthing center, facilities offering housing and custodial care, but not patient care (e.g., board and care home, group home, custodial care facility, foster home), check "Other (Specify)." If "Other (Specify)" is checked, specify where death was legally pronounced, such as prison ward, physician's office, the highway where a traffic accident occurred, a vessel, orphanage, group home, or at work.

If the place of death is unknown but the body is found in a State, enter the place where the body is found as the place of death.

15. FACILITY NAME (If not institution, give street & number)

Institution deaths

If the death occurred in a hospital, enter the full name of the hospital.

If death occurred en route to or on arrival at a hospital, enter the full name of the hospital. Deaths that occur in an ambulance or emergency squad vehicle en route to a hospital fall in this category.

If the death occurred in another type of institution such as a nursing home, enter the name of the institution where the decedent died.

Noninstitution deaths

If the death occurred at home, enter the house number and street name.

If the death occurred at some place other than those described above, enter the number and street name of the place or building (if at a building) where the decedent died.

If the death occurred on a moving conveyance, enter the name of the vessel, for example, *S.S. Olive Seas* (at sea) or *Eastern Airlines Flight 296* (in flight).

16. CITY OR TOWN, STATE, AND ZIP CODE

Enter the name of the city, town, village, or location, State, and ZIP code where death occurred.

17. COUNTY OF DEATH

Enter the name of the county of the institution or address given in item 15 for where death occurred. If the death occurred on a moving conveyance in the United States and the body is first removed from the conveyance in this State, complete a death certificate and enter as the place of death the address where the body was first removed from the conveyance.

If the death occurred on a moving conveyance in international waters, international airspace, or in a foreign country or its airspace, and the body is first removed from the conveyance in this State, register the death in this State, but enter the actual place of death insofar as can be determined.

These items are used to identify the place of death which is needed to determine who has jurisdiction for deaths that legally require investigation by a medical examiner or coroner. These items are also used for research and statistics comparing hospital and nonhospital deaths. Valuable information is also provided for health planning and on the utilization of health facilities.

18–20 DISPOSITION**18. METHOD OF DISPOSITION**

18. METHOD OF DISPOSITION: <input type="checkbox"/> Burial <input type="checkbox"/> Cremation <input type="checkbox"/> Donation <input type="checkbox"/> Entombment <input type="checkbox"/> Removal from State <input type="checkbox"/> Other (Specify): _____

Check the box corresponding to the method of disposition of the decedent's body. If the body is to be used by a hospital or a medical or mortuary school for scientific or educational purposes, enter "Donation" and specify the name and location of the institution in items 19 and 20. "Donation" refers only to the entire body, not to individual organs. If "Other (Specify)" is checked, enter the method of disposition on the line provided.

The response reflects the wishes of the next of kin or informant.

19. PLACE OF DISPOSITION (Name of cemetery, crematory, other place)

Enter the name of the cemetery, crematory, or other place of disposition. If the body is removed from the State, specify the name of the cemetery, crematory, or other place of disposition to which the body is removed.

If the body is to be used by a hospital or medical or mortuary school for scientific or educational purposes, give the name of that institution.

20. LOCATION—CITY, TOWN, AND STATE

Enter the name of the city, town, or village and the State where the place of disposition is located.

If the body of the decedent is to be used by a hospital or medical or mortuary school for scientific or educational purposes, enter the name of the city, town, or village and the State where the institution is located.

If there is any question about how to record the place of disposition, contact the State or local registrar.

This information indicates whether the body was properly disposed of as required by law. It also serves to locate the body in case exhumation, autopsy, or transfer is required later.

21–23 FUNERAL FACILITY

21. NAME AND COMPLETE ADDRESS OF FUNERAL FACILITY

Enter the name and complete address (including ZIP Code) of the facility handling the body prior to burial or other disposition.

These items assist in quality control in filling out and filing death certificates. They identify the person who is responsible for filing the certificate with the registrar.

22. SIGNATURE OF FUNERAL SERVICE LICENSEE OR OTHER AGENT

The funeral service licensee or other person first assuming custody of the body and charged with responsibility for completing the death certificate should sign in permanent black ink. If jurisdiction permits, authenticate electronically. Rubber stamps or facsimile signatures are not permitted.

23. LICENSE NUMBER (Of Licensee)

Enter the personal State license number of the funeral service licensee. If some other person who is not a licensed funeral director assumes custody of the body, identify the category of the license and corresponding State license number, or, if the individual possesses no license at all, enter “None.”

ITEMS ON WHEN DEATH OCCURRED

Items 24 and 25 and 29–31 should always be completed. If the facility uses a separate pronouncer or other person to indicate that death has taken place and another person more familiar with the case completes the remainder of the medical portion of the death certificate, the *pronouncer* completes items 24–28. In all other cases, the certifier completes items 24 and 25, 29–37, and 45–49, and items 26–28 are left blank.

24. DATE PRONOUNCED DEAD (Month, Day, Year)

Enter the exact month, day, and 4-digit year that the decedent was pronounced dead. Complete this item even when it is the same as item 29, the actual or presumed date.

Enter the full name of the month—January, February, March, etc. Do not use a number or abbreviation to designate the month.

This is used to identify the date the decedent was legally pronounced dead. This information is very helpful in those cases where a body of a person who has been dead for some time is found and the death is pronounced by a medical examiner or coroner.

25. TIME PRONOUNCED DEAD

Enter the exact time (hour and minute using a 24-hour clock) the decedent was pronounced dead according to local time. If daylight saving time is the official prevailing time where death occurs, it should be used to record the time of death. Be sure to indicate the time using a 24-hour clock.

24-hour clock	12-hour clock
0000 (medical facilities); 2400 (military facilities)	12 midnight
0100	1:00 a.m.
0200	2:00 a.m.
0300	3:00 a.m.
0400	4:00 a.m.
0500	5:00 a.m.
0600	6:00 a.m.
0700	7:00 a.m.
0800	8:00 a.m.
0900	9:00 a.m.
1000	10:00 a.m.
1100	11:00 a.m.
1200	12 noon
1300	1:00 p.m.
1400	2:00 p.m.
1500	3:00 p.m.
1600	4:00 p.m.
1700	5:00 p.m.
1800	6:00 p.m.
1900	7:00 p.m.
2000	8:00 p.m.
2100	9:00 p.m.
2200	10:00 p.m.
2300	11:00 p.m.

A death that occurs at 2400 or 0000 midnight belongs to the start of the new day. One minute after 12 midnight is entered as 0001 of the new day.

If the exact time of death is unknown, the time should be approximated by the person who pronounces the body dead. “Approx” should be placed before the time.

26–28 PRONOUNCING PHYSICIAN ONLY

Items 26–28 are to be completed only when the physician responsible for completing the medical certification of cause of death is not available at the time of death to certify the cause of death and the State has a law providing for a pronouncing physician. In this situation, a pronouncing physician is the person who determines that the decedent is legally dead but who was not in charge of the patient’s care for the illness or condition that resulted in death. This hospital physician certifies to the fact and time of death (items 24 and 25) and signs and dates the death certificate (items 26–28) so the body can be released. The attending physician is normally responsible for completing the cause-of-death section (item 32), but in medical examiner cases, the medical examiner may complete the cause of death. See section on medical certification of death in this handbook for a more detailed discussion of the completion of item 32.

COMPLETE ITEMS 26–28 ONLY WHEN CERTIFYING PHYSICIAN IS NOT AVAILABLE AT TIME OF DEATH TO CERTIFY CAUSE OF DEATH.

26. SIGNATURE OF PERSON PRONOUNCING DEATH (Only when applicable)

Obtain the signature in ink and the degree or title of the physician who pronounces death. This physician certifies to the time, date, and place of death only. Rubber stamps or facsimile signatures are not permitted on paper certificates. Jurisdictions with electronic death certificates may have other ways to authenticate the certification than by using a signature.

27. LICENSE NUMBER (Only when applicable)

Enter the State license number of the physician who pronounces death.

28. DATE SIGNED (Month, Day, Year) (Only when applicable)

Enter the exact month, day, and year that the pronouncing physician signs the certificate. Do not use a number to designate the month.

This information is useful for the quality control program by indicating that the medical certification was provided by the attending physician.

Items 24 and 25 must be completed by the person who pronounces death—the pronouncing physician, pronouncing/certifying physician, or medical examiner/coroner.

29. ACTUAL OR PRESUMED DATE OF DEATH (Month, Day, Year)

Enter the exact month, day, and year that death occurred.

Enter the full name of the month—January, February, March, etc. Do not use a number or abbreviation to designate the month.

Pay particular attention to the entry of month, day, or year when a death occurs around midnight or December 31. Consider a death at midnight to have occurred at the beginning of the next day rather than the end of the previous day. For instance, the date for a death that occurs at 11:59 p.m. or 2359 on December 31 should be recorded as December 31 while those occurring the next minute 0000 should be recorded as January 1.

If the exact date of death is unknown, it should be approximated by the person completing the medical certification. "Approx—" should be placed before the date. If date cannot be determined by approximating, the date found should be entered and identified as such.

This item is used in conjunction with the hour of death to establish the exact time of death of the decedent. Epidemiologists also use date of death in conjunction with the cause-of-death section for research on intervals between injuries, onset of conditions, and death.

30. ACTUAL OR PRESUMED TIME OF DEATH

Enter the exact time (hour and minute using a 24-hour clock) of death according to local time. If daylight saving time is the official prevailing time where death occurs, it should be used to record the time of death. Be sure to indicate the time using a 24-hour clock.

24-hour clock	12-hour clock
0000 (medical facilities); 2400 (military facilities)	12 midnight
0100	1:00 a.m.
0200	2:00 a.m.
0300	3:00 a.m.
0400	4:00 a.m.
0500	5:00 a.m.
0600	6:00 a.m.
0700	7:00 a.m.
0800	8:00 a.m.
0900	9:00 a.m.
1000	10:00 a.m.
1100	11:00 a.m.
1200	12 noon
1300	1:00 p.m.
1400	2:00 p.m.
1500	3:00 p.m.
1600	4:00 p.m.
1700	5:00 p.m.
1800	6:00 p.m.
1900	7:00 p.m.
2000	8:00 p.m.
2100	9:00 p.m.
2200	10:00 p.m.
2300	11:00 p.m.

A death that occurs at 2400 or 0000 midnight belongs to the start of the new day. One minute after 12 midnight is entered as 0001 of the new day.

If the exact time of death is unknown, the time should be approximated by the person who certifies the death. "Approx—" should be placed before the time.

This item establishes the exact time of death which is important in inheritance cases when there is a question of who died first. This is often important in the case of multiple deaths in the same family.

31. WAS MEDICAL EXAMINER OR CORONER CONTACTED?

31. WAS MEDICAL EXAMINER OR CORONER CONTACTED? <input type="checkbox"/> Yes <input type="checkbox"/> No
--

Enter “Yes” if the medical examiner or coroner was contacted in reference to this case. Otherwise enter “No.” Do not leave this item blank.

In cases of accident, suicide, or homicide, the medical examiner or coroner must be notified.

This item records whether the medical examiner or coroner was informed when the circumstances require such action. In such cases, the physician must ensure that this is done.

32. CAUSE OF DEATH

Detailed instructions for this item, together with case records, are contained in the section on Medical Certification of Death in this handbook.

These items are to be completed by the attending physician or medical examiner/coroner certifying or reporting his or her opinion on the cause of death.

Part I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.

The cause of death means the disease, abnormality, injury, or poisoning that caused the death, not the mechanism of death, such as cardiac or respiratory arrest, shock, or heart failure.

In Part I, the immediate cause of death (final disease or condition resulting in death) is reported on line (a). Antecedent conditions, if any, that gave rise to the cause are reported on lines (b), (c), and (d). The underlying cause (disease or injury that initiated events resulting in death) should be reported on the last line used in Part I. No entry is necessary on lines (b), (c), and (d) if the immediate cause of death on line (a) describes completely the sequence of events. ONLY ONE CAUSE SHOULD BE ENTERED ON A LINE.

Provide the best estimate of the interval between the onset of each condition and death. Do not leave the space for the interval blank; if unknown, so specify.

Part II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

In Part II, enter other important diseases or conditions that contributed to death but did not result in the underlying cause of death given in Part I.

Cause of death is the most important statistical research item on the death certificate. It provides medical information that serves as a basis for describing trends in human health and mortality and for analyzing the conditions leading to death. Mortality statistics provide a basis for epidemiological studies that focus on leading causes of death by age, race, or sex (for example, AIDS, heart disease, and cancer). They also provide a basis for research in disease etiology and evaluation of diagnostic techniques, which in turn lead to improvements in patient care.

All conditions reported are important and are analyzed. For example, analyses may examine associations between conditions reported on the same death certificates such as types of conditions reported in combination with hepatitis.

33. WAS AN AUTOPSY PERFORMED?

33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No

Enter "Yes" if a partial or complete autopsy was performed. Otherwise enter "No."

An autopsy is important in giving additional insight into the conditions that lead to death. This additional information is particularly important in arriving at the immediate and underlying causes when the cause is not immediately clear.

34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH?

34. WERE AUTOPSY FINDINGS AVAILABLE TO
COMPLETE THE CAUSE OF DEATH? ☐ Yes ☐ No

Enter "Yes," if the autopsy findings were available at the time that cause of death was determined. Otherwise enter "No." Leave this item blank if no autopsy was performed.

This information assists in determining whether, for the 9 percent of cases for which an autopsy is done, the information was available to assist in determining the cause of death. Knowing whether the autopsy results were available for determining the cause of death gives insight into the quality of the cause-of-death data.

35. DID TOBACCO USE CONTRIBUTE TO DEATH?

Check "Yes" if, in the medical examiner's or coroner's opinion, any use of tobacco or tobacco exposure contributed to death. Tobacco use may contribute to deaths due to a wide variety of diseases; for example, tobacco use contributes to many deaths due to emphysema or lung cancer and some heart disease and cancers of the head and neck. Check "No" if, in his or her opinion, the use of tobacco did not contribute to death.

36. IF FEMALE, WAS DECEDENT PREGNANT AT TIME OF DEATH OR WITHIN PAST YEAR?

If the decedent is a female, check the appropriate box in item 36. If the decedent is a male, leave the item blank. If the female is either too old or too young to be fecund, check the not pregnant within the past year box.

This information is important in determining the scale of mortality among this population and will be of assistance with maternal mortality review programs.

37. MANNER OF DEATH

37. MANNER OF DEATH

☐ Natural ☐ Homicide

☐ Accident ☐ Pending Investigation

☐ Suicide ☐ Could not be determined

Complete this item for all deaths. Check the box corresponding to the manner of death. Deaths not due to external causes should be identified as “Natural.” Usually, these are the only types of deaths a physician will certify.

Indicate “Pending Investigation” if the manner of death cannot be determined to be accident, homicide, or suicide within the statutory time limit for filing the death certificate. This should be changed later to one of the other terms.

Indicate “Could not be determined” ONLY when it is impossible to determine the manner of death.

In cases of accidental death this information is used to justify the payment of double indemnity on life insurance policies. It is also used to obtain a more accurate determination of cause of death.

All deaths due to external causes must be referred to the medical examiner or coroner. If the manner of death checked in item 37 was anything other than natural, items 38–44 must be completed.

The National Association of Medical Examiners has put together a guide on how manner of death should be determined (9). In certain cases, the manner of death preferred by the medical examiner community and the disease classification conflict. As a result, it is important to specify the circumstances involved so that both communities are able to make use of the information.

38–44 ACCIDENT OR INJURY—to be filled out in all cases of deaths due to injury or poisoning

Complete these items in cases where injury caused or contributed to the death. All deaths resulting from injury must be reported to a medical examiner or coroner, who will usually certify to the cause of death.

38. DATE OF INJURY (Month, Day, Year)

Enter the exact month, day, and year that the injury occurred. Enter the full name of the month—January, February, March, etc. Do not use a number or abbreviation to designate the month.

The date of injury may not necessarily be the same as the date of death.

Estimates may be provided with “Approx—” placed before the date.

39. TIME OF INJURY

Enter the exact time (hour and minute using a 24-hour clock) when the injury occurred, according to local time. If daylight saving time is the official prevailing time where death occurs, it should be used to record the time of death. Be sure to indicate the time using a 24-hour clock.

24-hour clock	12-hour clock
0000 (medical facilities); 2400 (military facilities)	12 midnight
0100	1:00 a.m.
0200	2:00 a.m.
0300	3:00 a.m.
0400	4:00 a.m.
0500	5:00 a.m.
0600	6:00 a.m.
0700	7:00 a.m.
0800	8:00 a.m.
0900	9:00 a.m.
1000	10:00 a.m.
1100	11:00 a.m.
1200	12 noon
1300	1:00 p.m.
1400	2:00 p.m.
1500	3:00 p.m.
1600	4:00 p.m.
1700	5:00 p.m.
1800	6:00 p.m.
1900	7:00 p.m.
2000	8:00 p.m.
2100	9:00 p.m.
2200	10:00 p.m.
2300	11:00 p.m.

If the exact time of death is unknown, the time should be approximated by the person who certifies the death. “Approx—” should be placed before the time.

The date of injury may differ from the date of death.

40. PLACE OF INJURY (e.g., Decedent’s home; construction site; restaurant; wooded area)

Enter the general type of place (such as restaurant, vacant lot, baseball field, construction site, office building, or decedent’s home) where the injury occurred. DO NOT enter firm or organization names. (For example, enter “factory,” not “Standard Manufacturing, Inc.”)

41. INJURY AT WORK?

41. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No

Complete if anything other than natural disease is mentioned in Part I or Part II of the medical certification (item 32), including homicides, suicides, and accidents or if anything other than natural is checked for manner of death (item 37). This includes all motor vehicle deaths. The item must be completed for decedents ages 14 years or over and may be completed for those less than 14 years of age if warranted.

Enter "Yes" if the injury occurred at work. Otherwise enter "No." An injury may occur at work regardless of whether the injury occurred in the course of the decedent's "usual" occupation.

Examples of injury at work and injury not at work follow:

Injury at work

Injury while working or in vocational training on job premises
Injury while on break or at lunch or in parking lot on job premises
Injury while working for pay or compensation, including at home
Injury while working as a volunteer law enforcement official, etc.
Injury while traveling on business, including to or from business contacts

Injury not at work

Injury while engaged in personal recreational activity on job premises
Injury while a visitor (not on official work business) to job premises
Homemaker working at homemaking activities
Student in school
Working for self for no profit (mowing yard, repairing own roof, hobby)
Commuting to or from work

These guidelines were developed jointly by: The National Association for Public Health Statistics and Information Systems (NAPHSIS), the National Institute of Occupational Safety and Health (NIOSH), the National Center for Health Statistics (NCHS), and the National Center for Environmental Health and Injury Control (NCEHIC). For questions contact the State Vital Statistics Office.

42. LOCATION OF INJURY (Street and Number, City or Town, State, Apartment No., Zip Code)

Enter the complete address where the injury took place including ZIP Code. Fill in as many of the items as is known.

43. DESCRIBE HOW INJURY OCCURRED

Enter, in narrative form, a brief but specific and clear description of how the injury occurred. Explain the circumstances or cause of the injury, such as "fell off ladder while painting house," "driver of car ran off roadway," or "passenger in car in car-truck collision." Specify **type of gun** (e.g., handgun, hunting rifle) or **type of vehicle** (e.g., car, bulldozer, train, etc.)

when it is relevant to circumstances. Indicate if more than one vehicle is involved; specify type of vehicle decedent was in. For motor vehicle accidents, indicate whether the decedent was a driver, passenger, or pedestrian.

If known, indicate what activity the decedent was engaged in when the injury occurred (e.g., playing a sport, working for income, hanging out at a bar).

In cases of accidental death, items 38–43 are used in justifying the payment of double indemnity on life insurance policies. They are also needed for a more accurate determination of causes of death. Information from these items forms the basis of statistical studies of occupational injuries.

44. IF TRANSPORTATION INJURY, SPECIFY:

<p>44. IF TRANSPORTATION INJURY, SPECIFY:</p> <p><input type="checkbox"/> Driver/Operator</p> <p><input type="checkbox"/> Passenger</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Other (Specify)</p>
--

Specify role of decedent (e.g., driver, passenger) in the transportation accident. Driver/operator and passenger should be designated for modes other than motor vehicles such as bicycles. “Other” applies to watercraft, aircraft, animal, or people attached to outside of vehicles (e.g., “surfers”) who are not bonafide passengers or drivers.

Details will help assign deaths to categories that may be used to assess trends and effectiveness of safety programs.

45–49 CERTIFIER

45. CERTIFIER (Check only one)

<p>45. CERTIFIER (Check only one):</p> <p><input type="checkbox"/> Certifying physician-To the best of my knowledge, death occurred due to the cause(s) and manner stated.</p> <p><input type="checkbox"/> Pronouncing & Certifying physician-To the best of my knowledge, death occurred at the time, date, and place, and due to the cause(s) and manner stated.</p> <p><input type="checkbox"/> Medical Examiner/Coroner-On the basis of examination, and/or investigation, in my opinion, death occurred at the time, date, and place, and due to the cause(s) and manner stated.</p> <p>Signature of certifier: _____</p>
--

The CERTIFYING PHYSICIAN box should be checked only in those cases when the person who is completing the medical certification of cause of death (item 32) is not the person who pronounced death (items 24 and 25). The certifying physician is responsible for completing items 32–49.

The PRONOUNCING & CERTIFYING PHYSICIAN box should be checked when the same person is responsible for completing items 24–49, that is, when the same physician has both pronounced death and certified the cause of death. If this box is checked, items 26–28 should be left blank.

The MEDICAL EXAMINER/CORONER box should be checked when investigation is required by the Post Mortem Examination Act and the cause of death is completed by a medical examiner or coroner. The medical examiner/coroner is responsible for completing items 24–49.

SIGNATURE OF CERTIFIER

The medical-legal officer who certifies the cause of death in item 32 signs the certificate in permanent black ink. Jurisdictions with an electronic death certificate may allow electronic authentication. The degree or title of the medical-legal officer should also be indicated. Rubber stamps or facsimile signatures are not permitted.

46. NAME, ADDRESS, AND ZIP CODE OF PERSON COMPLETING CAUSE OF DEATH (Item 32)

Enter the full name and address of the person whose signature or authentication appears in item 45.

This information is used by the State office of vital statistics for querying the certifier when a question about cause of death arises.

48. LICENSE NUMBER

Enter the State license number of the medical-legal officer who signs or authenticates the certificate in item 45.

This number assists in State quality control programs when it is necessary to contact the certifier for additional information concerning the death.

49. DATE CERTIFIED (Month, Day, Year)

Enter the exact month, day, and year that the certifier signed the certificate.

Enter the full name of the month—January, February, March, etc. Do not use a number or an abbreviation to designate the month.

These items are of legal value in attesting that the medical certification was completed and signed within the time limit required by statute.

51. DECEDENT'S EDUCATION

Check the box that corresponds to the highest level of education that the decedent completed.

Show the informant the education level categories on a card (see [appendix B](#)), and ask the informant to choose the category that, to the best of his or her knowledge, describes the highest education level completed by the decedent.

- ☐ 8th grade or less
- ☐ 9th–12th grade; no diploma
- ☐ High School Graduate or GED completed
- ☐ Some college credit; but no degree
- ☐ Associate Degree (e.g., AA, AS)
- ☐ Bachelor's Degree (e.g., BA, AB, BS)
- ☐ Master's Degree (e.g., MA, MS, MEng, MEd, MSW, MBA)
- ☐ Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD)

If the decedent was currently enrolled, mark the previous grade of highest degree received. If the respondent does not know or is not sure, select "Unknown." If the respondent refuses, enter "Refused." If there is no informant or for some other reason the information is not available, enter "Not obtainable."

If the respondent indicates that the decedent has a degree that is not listed on the card, enter "Not classifiable."

This information is used to study the relationship between mortality and education (which roughly corresponds with socioeconomic status). This information is valuable in medical studies of causes of death and in programs to prevent illness and death.

52. DECEDENT OF HISPANIC ORIGIN?

Based on the informant's response, check the box (see card in [appendix C](#)) that best corresponds with the decedent's ethnic identity as given by the informant. The response should reflect what the decedent considered himself or herself to be. The informant is encouraged to select only one response. If the informant is unable to select a single response, mark all boxes that apply; for example "Mexican" and "Cuban," enter both responses. If the respondent indicates an ethnic origin not on the list, it should be recorded in the "Specify" space. Enter the informant's response even if it is not a Hispanic origin.

The choices are as follows:

- ☐ No, Not Spanish/Hispanic/Latino
- ☐ Yes, Mexican, Mexican American, Chicano
- ☐ Yes, Puerto Rican
- ☐ Yes, Cuban
- ☐ Yes, Other Spanish/Hispanic/Latino
(Specify) _____

Each question, Race and Hispanic Origin, should be asked independently. "Hispanic" is not a race, and a decedent of Hispanic origin may be of any race. Do not leave item 52 blank. "Hispanic" is a self-designated classification for people whose origins are from Spain, the Spanish-speaking countries of Central or South America, the Caribbean, or those identifying themselves generally as Spanish or Spanish-American. Origin can be viewed as ancestry, nationality, or country of birth of the person or person's parents or ancestors prior to their arrival in the United States. Although the prompts include the major Hispanic groups, other groups may be specified under "Other."

If the informant does not know, enter "Unknown."

If there is no informant, enter "Not obtainable."

If respondent refuses, enter "Refused."

Hispanics comprise a substantial population group within this country. Reliable data are needed to identify and assess public health problems of Hispanics. Information from item 52 will permit the production of mortality data for the Hispanic community. Identifying health problems will make it possible to target public health resources to this important segment of our population.

53. DECEDENT'S RACE

Ask the informant to look at the card (see [appendix C](#)) and indicate the race or races of the decedent. Enter the race or races of the decedent as stated by the informant. Each question, Race and Hispanic origin, should be asked independently. Do not leave item 53 blank. If there is no box for the informant's response for one or more race, check the box "Other" and enter the informant's literal (written) response even if the response is not a race or race(s).

Check one or more of the following choices to indicate what the decedent considered himself/herself to be:

- ☐ White
☐ Black or African American
☐ American Indian or Alaska Native
 (Name of the enrolled or principal tribe) _____
☐ Asian Indian
☐ Chinese
☐ Filipino
☐ Japanese
☐ Korean
☐ Vietnamese
☐ Other Asian (Specify) _____
☐ Native Hawaiian
☐ Guamanian or Chamorro
☐ Samoan
☐ Other Pacific Islander (Specify) _____
☐ Other (Specify) _____

American Indian and Alaska Native refer only to those native to North and South America (including Central America) and does not include Asian Indian. Please specify the name of enrolled or principal tribe (e.g., Navajo, Cheyenne, etc.) for the American Indian or Alaska Native.

For Asians and Pacific Islanders, enter the national origin of the decedent. For Asians check Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, or specify other Asian group; for Pacific Islanders check Native Hawaiian, Guamanian or Chamorro, Samoan, or specify Other Pacific Islander.

If more than one race is indicated, enter each race (e.g., Samoan-Chinese-Filipino or White, American Indian).

If there is no informant or other reliable source of this information, enter "Not obtainable." If the respondent does not know, enter "Unknown." If the respondent refuses, enter "Refused."

Race is essential for identifying specific mortality patterns and leading causes of death among different racial groups. It is also used to determine if specific health programs are needed in particular areas and to make population estimates.

54 and 55 OCCUPATION AND INDUSTRY OF DECEDENT

These items are to be completed for all decedents 14 years of age and over. Enter the information even if the decedent was retired, disabled, or institutionalized at the time of death.

This information is useful in studying deaths related to jobs and in identifying any new risks. For example, the link between lung disease and lung cancer and asbestos exposure in jobs such as shipbuilding or construction was discovered by analyzing this sort of information on death certificates.

54. DECEDENT'S USUAL OCCUPATION (Indicate type of work done during most of working life. DO NOT USE RETIRED.)

Enter the usual occupation of the decedent. This means the type of job the individual was engaged in for most of his or her working life. It is not necessarily the highest paid job nor the job considered the most prestigious, but the one occupation, of perhaps several, that accounted for the greatest number of working years. For example, usual occupation may include claim adjuster, farmhand, coal miner, janitor, store manager, college professor, or civil engineer. Never enter "Retired."

If the decedent was a homemaker at the time of death but had worked outside the household during his or her working life, enter that occupation. If the decedent was a "homemaker" during most of his or her working life, or never worked outside the household, enter "Homemaker." Enter "Student" if the decedent was a student at the time of death and was never regularly employed or employed full time during his or her working life.

If not known, enter "Unknown."

55. KIND OF BUSINESS/INDUSTRY

Enter the kind of business or industry to which the occupation listed in item 54 is related, such as insurance, farming, coal mining, hardware store, retail clothing, university, or government. Do not enter firm or organization names.

If the decedent was a homemaker during his or her working life, and "Homemaker" is entered as the decedent's usual occupation in item 54, enter "Own home" or "Someone else's home," whichever is appropriate.

If the decedent was a student at the time of death and "Student" is entered as the decedent's usual occupation in item 54, enter the type of school, such as high school or college, in item 55.

These items are useful in studying occupationally related mortality and in identifying job-related risk areas. For example, correlating asbestos used in particular occupations in the shipbuilding industry to respiratory cancer was possible with this information. If the medical examiner or coroner have

questions about what classification to use for a decedent's occupation or industry, refer to the handbook "Guidelines for Reporting Occupation and Industry on Death Certificates (21)."

If not known, enter "Unknown."

Completing the Cause of Fetal Death

The primary responsibility of the medical examiner or coroner whose name appears in item 14 of the Fetal Death Report is to complete the cause-of-fetal-death section (items 18a and b, e–h on the report which are collected using items 33–38 on the facility worksheet).

Cause of fetal death

A facsimile of the section on cause of fetal death of the Fetal Death Report is shown on the following page. It is designed to facilitate the reporting of the causes of fetal death and places upon the medical examiner or coroner the responsibility for indicating the conditions and events resulting in the fetal death.

The cause-of-death section consists of two parts. The initiating cause/condition (item 18a) is for reporting a single condition that most likely began the sequence of events resulting in the death of the fetus. Other significant causes or conditions (item 18b) include all other conditions contributing to death. These conditions may be conditions that are triggered by the initiating cause (item 18a) or causes that are not among the sequence of events triggered by the initiating cause (item 18a).

The cause-of-death information should be the medical examiner's or coroner's best medical opinion. Report a specific condition in the space most appropriate to the given situation. A condition can be listed as "probable" if it has not been definitively diagnosed. In reporting the causes of fetal death, conditions in the fetus or mother, or of the placenta, cord, or membranes, should be reported if they are believed to have adversely affected the fetus.

The American College of Obstetrics and Gynecology Technical bulletin number 176 provides guidelines on a full investigation of a fetal death. Cause of fetal death should include information provided by the pathologist if tissue analysis, autopsy, or another type of postmortem exam was done. If microscopic exams for a fetal death are still pending at the time the report is filed, the additional information should be reported to the registrar as soon as it is available.

For statistical and research purposes, it is important that the reporting of the medical information on the fetal death report be specified as precisely as possible. Cause of death is used for medical and epidemiological research on disease etiology and to evaluate the effectiveness of diagnostic and therapeutic techniques. It is a measure of health status at local, State, national, and international levels.

Responsibility of medical examiner or coroner

When a death occurs without medical attendance at or immediately after the delivery, or when further investigation is required by State regulations, a medical examiner or coroner may investigate the fetal death. The death should be reported to the medical examiner or coroner as required by State law.

CAUSE OF FETAL DEATH Mother's Name _____ Mother's Medical Record No. _____		18. CAUSE/CONDITIONS CONTRIBUTING TO FETAL DEATH		
		18a. INITIATING CAUSE/CONDITION (AMONG THE CHOICES BELOW, PLEASE SELECT THE ONE WHICH MOST LIKELY BEGAN THE SEQUENCE OF EVENTS RESULTING IN THE DEATH OF THE FETUS)		18b. OTHER SIGNIFICANT CAUSES OR CONDITIONS (SELECT OR SPECIFY ALL OTHER CONDITIONS CONTRIBUTING TO DEATH IN ITEM 18a)
		Maternal Conditions/Diseases (Specify) _____ _____ Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input checked="" type="checkbox"/> Abruption placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify) _____ Other Obstetrical or Pregnancy Complications (Specify) _____ _____ Fetal Anomaly (Specify) _____ _____ Fetal Injury (Specify) _____ _____ Fetal Infection (Specify) _____ _____ Other Fetal Conditions/Disorders (Specify) _____ _____ <input type="checkbox"/> Unknown		Maternal Conditions/Diseases (Specify) _____ _____ Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruption placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify) _____ Other Obstetrical or Pregnancy Complications (Specify) _____ _____ <u>Intrauterine anoxia</u> Fetal Anomaly (Specify) _____ _____ Fetal Injury (Specify) _____ _____ Fetal Infection (Specify) _____ _____ Other Fetal Conditions/Disorders (Specify) _____ _____ <input type="checkbox"/> Unknown
18c. WEIGHT OF FETUS (grams preferred, specify unit) _____ 1,550 <input checked="" type="checkbox"/> grams <input type="checkbox"/> lb/oz		18e. ESTIMATED TIME OF FETAL DEATH <input checked="" type="checkbox"/> Dead at time of first assessment, no labor ongoing <input type="checkbox"/> Dead at time of first assessment, labor ongoing <input type="checkbox"/> Died during labor, after first assessment <input type="checkbox"/> Unknown time of fetal death	18f. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Planned 18g. WAS A HISTOLOGICAL PLACENTAL EXAMINATION PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Planned 18h. WERE AUTOPSY OR HISTOLOGICAL PLACENTAL EXAMINATION RESULTS USED IN DETERMINING THE CAUSE OF FETAL DEATH? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
18d. OBSTETRIC ESTIMATE OF GESTATION AT DELIVERY _____ 36 (completed weeks)				

Instructions for completing cause of fetal death

Cause-of-death information should be the medical examiner's or coroner's best medical opinion. Abbreviations and parenthetical statements should be avoided in reporting causes of death. The terminal event should not be used. The medical examiner or coroner should report the initiating cause of the terminal event in 18a.

If two or more possible sequences resulted in death, or if two conditions seem to have an interactive effect, the condition that most directly caused death, in the opinion of the certifier, should be reported in 18a.

If an organ system failure is listed as a cause of death, always report its etiology. Always report the fatal injury (e.g., stab wound of mother's abdomen), the trauma, and impairment of function.

In 18b, report all diseases or conditions contributing to death that were not reported in 18a and that did not result in the initiating cause of death.

The original fetal death report should be amended if additional medical information or autopsy or histological placental findings become available that would change the cause of death originally reported.

Specify conditions as fetal or maternal

The conditions are set up to facilitate reporting maternal conditions on the "Maternal Conditions/Diseases (Specify)" lines and fetal conditions and obstetrical or pregnancy complications on the remaining lines.

For example, the completed cause of fetal death below indicates asphyxia to the fetus due to a homicide by stabbing of the mother.

18. CAUSE/CONDITIONS CONTRIBUTING TO FETAL DEATH		
CAUSE OF FETAL DEATH Mother's Name _____ Mother's Medical Record No. _____	18a. INITIATING CAUSE/CONDITION (AMONG THE CHOICES BELOW, PLEASE SELECT THE ONE WHICH MOST LIKELY BEGAN THE SEQUENCE OF EVENTS RESULTING IN THE DEATH OF THE FETUS) Maternal Conditions/Diseases (Specify) <u>Mother stabbed to death in a homicide</u> Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruptio placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify) _____ Other Obstetrical or Pregnancy Complications (Specify) _____ Fetal Anomaly (Specify) _____ Fetal Injury (Specify) _____ Fetal Infection (Specify) _____ Other Fetal Conditions/Disorders (Specify) _____ <input type="checkbox"/> Unknown	
	18b. OTHER SIGNIFICANT CAUSES OR CONDITIONS (SELECT OR SPECIFY ALL OTHER CONDITIONS CONTRIBUTING TO DEATH IN ITEM 18a) Maternal Conditions/Diseases (Specify) _____ Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruptio placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify) _____ Other Obstetrical or Pregnancy Complications (Specify) _____ Fetal Anomaly (Specify) _____ Fetal Injury (Specify) _____ Fetal Infection (Specify) _____ Other Fetal Conditions/Disorders (Specify) <u>Asphyxia</u> <input type="checkbox"/> Unknown	
18c. WEIGHT OF FETUS (grams preferred, specify unit) <u>1,550</u> <input checked="" type="checkbox"/> grams <input type="checkbox"/> lb/oz	18e. ESTIMATED TIME OF FETAL DEATH <input checked="" type="checkbox"/> Dead at time of first assessment, no labor ongoing <input type="checkbox"/> Dead at time of first assessment, labor ongoing <input type="checkbox"/> Died during labor, after first assessment <input type="checkbox"/> Unknown time of fetal death	18f. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Planned 18g. WAS A HISTOLOGICAL PLACENTAL EXAMINATION PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Planned 18h. WERE AUTOPSY OR HISTOLOGICAL PLACENTAL EXAMINATION RESULTS USED IN DETERMINING THE CAUSE OF FETAL DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
18d. OBSTETRIC ESTIMATE OF GESTATION AT DELIVERY <u>36</u> (completed weeks)		

Supplemental report of cause of fetal death

In many instances, information on the cause of fetal death may be pending further study of tissue or autopsy results, cytogenetic study, or a pathology report. When additional information is obtained, the medical examiner or coroner should file a supplemental report of cause of fetal death.

Other items for medical certification

Additional information required from the medical examiner or coroner includes estimated time of fetal death (item 18e), was an autopsy performed? (item 18f), was a histological placental examination performed? (item 18g), and were autopsy or histological placental examination results used in determining the cause of fetal death? (item 18h).

Examples of reporting cause of fetal death**Case History No. 1**

The mother was a 29-year-old gravida 1, para 0 woman with a history of drug abuse. She had a normal pregnancy until 28 weeks' gestation when hydramnios was noted. Ultrasonography suggested anencephaly. No fetal movement was noted, nor were fetal heart sounds audible. Labor was induced, and a stillborn anencephalic fetus weighing 1,100 grams was delivered.

18. CAUSE/CONDITIONS CONTRIBUTING TO FETAL DEATH			
CAUSE OF FETAL DEATH Mother's Name _____ Mother's Medical Record No. _____	18a. INITIATING CAUSE/CONDITION (AMONG THE CHOICES BELOW, PLEASE SELECT THE ONE WHICH MOST LIKELY BEGAN THE SEQUENCE OF EVENTS RESULTING IN THE DEATH OF THE FETUS) Maternal Conditions/Diseases (Specify) _____ Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruptio placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify) _____ Other Obstetrical or Pregnancy Complications (Specify) _____ Fetal Anomaly (Specify) <u>Anencephaly</u> Fetal Injury (Specify) _____ Fetal Infection (Specify) _____ Other Fetal Conditions/Disorders (Specify) _____ <input type="checkbox"/> Unknown	18b. OTHER SIGNIFICANT CAUSES OR CONDITIONS (SELECT OR SPECIFY ALL OTHER CONDITIONS CONTRIBUTING TO DEATH IN ITEM 18a) Maternal Conditions/Diseases (Specify) <u>Maternal drug use</u> Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruptio placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify) _____ Other Obstetrical or Pregnancy Complications (Specify) _____ <u>Intrauterine anoxia</u> Fetal Anomaly (Specify) _____ Fetal Injury (Specify) _____ Fetal Infection (Specify) _____ Other Fetal Conditions/Disorders (Specify) _____ <input type="checkbox"/> Unknown	
	18c. WEIGHT OF FETUS (grams preferred, specify unit) <u>1,100</u> <input checked="" type="checkbox"/> grams <input type="checkbox"/> lb/oz	18e. ESTIMATED TIME OF FETAL DEATH <input checked="" type="checkbox"/> Dead at time of first assessment, no labor ongoing <input type="checkbox"/> Dead at time of first assessment, labor ongoing <input type="checkbox"/> Died during labor, after first assessment <input type="checkbox"/> Unknown time of fetal death	18f. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Planned 18g. WAS A HISTOLOGICAL PLACENTAL EXAMINATION PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Planned
	18d. OBSTETRIC ESTIMATE OF GESTATION AT DELIVERY <u>28</u> (completed weeks)	18h. WERE AUTOPSY OR HISTOLOGICAL PLACENTAL EXAMINATION RESULTS USED IN DETERMINING THE CAUSE OF FETAL DEATH? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

Note: The drug(s) should be specified when known.

Case History No. 2

The mother had a normal pregnancy until 28 weeks' gestation when she noticed the absence of fetal movement, which was confirmed by ultrasound. There were no audible fetal heart sounds. Labor was induced and the mother was delivered of a 900-gram fetus, apparently female, delivered after prostaglandin.

The facies was abnormal with depressed nasal bridge, anteverted nostrils, small mouth, small posteriorly rotated ears, and midline frontal bossing. There was an umbilical hernia and a sacral neural tube defect (meningocele).

CAUSE OF FETAL DEATH		18. CAUSE/CONDITIONS CONTRIBUTING TO FETAL DEATH		
		18a. INITIATING CAUSE/CONDITION (AMONG THE CHOICES BELOW, PLEASE SELECT THE ONE WHICH MOST LIKELY BEGAN THE SEQUENCE OF EVENTS RESULTING IN THE DEATH OF THE FETUS)	18b. OTHER SIGNIFICANT CAUSES OR CONDITIONS (SELECT OR SPECIFY ALL OTHER CONDITIONS CONTRIBUTING TO DEATH IN ITEM 18b)	
Mother's Name Mother's Medical Record No.	Maternal Conditions/Diseases (Specify) _____	Maternal Conditions/Diseases (Specify) _____		
	Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruptio placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify) _____	Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruptio placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify) _____		
	Other Obstetrical or Pregnancy Complications (Specify) _____	Other Obstetrical or Pregnancy Complications (Specify) _____		
	Fetal Anomaly (Specify) <u>Probable chromosome anomaly-pending</u> <u>cytogenetics report</u>	Fetal Anomaly (Specify) <u>Multiple congenital anomaly syndrome</u>		
	Fetal Injury (Specify) _____	Fetal Injury (Specify) _____		
	Fetal Infection (Specify) _____	Fetal Infection (Specify) _____		
	Other Fetal Conditions/Disorders (Specify) _____	Other Fetal Conditions/Disorders (Specify) _____		
	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown		
18c. WEIGHT OF FETUS (grams preferred, specify unit) <u>900</u> <input checked="" type="checkbox"/> grams <input type="checkbox"/> lb/oz		18d. ESTIMATED TIME OF FETAL DEATH <input checked="" type="checkbox"/> Dead at time of first assessment, no labor ongoing <input type="checkbox"/> Dead at time of first assessment, labor ongoing <input type="checkbox"/> Died during labor, after first assessment <input type="checkbox"/> Unknown time of fetal death		18e. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Planned
18f. OBSTETRIC ESTIMATE OF GESTATION AT DELIVERY <u>28</u> (completed weeks)		18g. WAS A HISTOLOGICAL PLACENTAL EXAMINATION PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Planned		18h. WERE AUTOPSY OR HISTOLOGICAL PLACENTAL EXAMINATION RESULTS USED IN DETERMINING THE CAUSE OF FETAL DEATH? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

The external genitalia were ambiguous. There was syndactyly of toes two and three, and rockerbottom feet bilaterally. The fingers were short and edematous; there were no flexion creases on the palms of either hand.

Gross autopsy revealed internally that the genitalia were those of a normal male. The adrenals were small. There were several accessory spleens, partial malrotation of the gut, and an atrial septal defect. The placenta had trophoblastic cysts. Tissues (muscle and fetal membranes) were taken for future chromosome analysis.

Two weeks later a chromosome analysis report became available that provided a diagnosis of triploidy, karyotype XXY. A supplemental report of cause of fetal death was filed with the registrar of vital statistics.

CAUSE OF FETAL DEATH		18. CAUSE/CONDITIONS CONTRIBUTING TO FETAL DEATH		
		18a. INITIATING CAUSE/CONDITION (AMONG THE CHOICES BELOW, PLEASE SELECT THE ONE WHICH MOST LIKELY BEGAN THE SEQUENCE OF EVENTS RESULTING IN THE DEATH OF THE FETUS)	18b. OTHER SIGNIFICANT CAUSES OR CONDITIONS (SELECT OR SPECIFY ALL OTHER CONDITIONS CONTRIBUTING TO DEATH IN ITEM 18b)	
Mother's Name Mother's Medical Record No.		Maternal Conditions/Diseases (Specify) _____	Maternal Conditions/Diseases (Specify) _____	
		Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruptio placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify) _____	Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruptio placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify) _____	
		Other Obstetrical or Pregnancy Complications (Specify) _____	Other Obstetrical or Pregnancy Complications (Specify) _____	
		Fetal Anomaly (Specify) <u>Triploidy syndrome XXY</u>	Fetal Anomaly (Specify) <u>Multiple congenital anomaly syndrome</u>	
		Fetal Injury (Specify) _____	Fetal Injury (Specify) _____	
		Fetal Infection (Specify) _____	Fetal Infection (Specify) _____	
		Other Fetal Conditions/Disorders (Specify) _____	Other Fetal Conditions/Disorders (Specify) _____	
		<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown	
	18c. WEIGHT OF FETUS (grams preferred, specify unit) <u>900</u> <input checked="" type="checkbox"/> grams <input type="checkbox"/> lb/oz	18d. OBSTETRIC ESTIMATE OF GESTATION AT DELIVERY <u>28</u> (completed weeks)	18e. ESTIMATED TIME OF FETAL DEATH <input checked="" type="checkbox"/> Dead at time of first assessment, no labor ongoing <input type="checkbox"/> Dead at time of first assessment, labor ongoing <input type="checkbox"/> Died during labor, after first assessment <input type="checkbox"/> Unknown time of fetal death	18f. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Planned 18g. WAS A HISTOLOGICAL PLACENTAL EXAMINATION PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Planned 18h. WERE AUTOPSY OR HISTOLOGICAL PLACENTAL EXAMINATION RESULTS USED IN DETERMINING THE CAUSE OF FETAL DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Common problems in fetal death certification

Uncertainty

Often several acceptable ways of writing a cause-of-death statement exist. Optimally, a certifier will be able to provide a simple description of the initiating cause and other contributing causes that is etiologically clear and to be confident that this is correct. However, realistically, description of the process is sometimes difficult because the certifier is not certain.

In this case, the certifier should think through the causes about which he/she is confident and what possible etiologies could have resulted in these conditions. The certifier should select the causes that are suspected to have been involved and use words such as “probable” or “presumed” to indicate that the description provided is not completely certain. Causes of death on the fetal death report should not include terms such as “prematurity” without explaining the etiology because they have little value for public health or medical research.

Reporting a cause of fetal death as unknown should be a last resort.

When a number of conditions or multiple organ/system failure resulted in death, the physician, medical examiner, or coroner should choose a single condition which most likely began the sequence of events resulting in the fetal death and list the other conditions in 18b of the certification section. “Multiple system failure” could be included as an “other significant cause or condition,” but also specify the systems involved to ensure that the detailed information is captured. Maternal conditions may have initiated or affected the sequence that resulted in a fetal death. These maternal conditions should be reported in the cause-of-death statement in addition to the fetal causes.

Avoid ambiguity

Most certifiers will find themselves, at some point, unable to provide a simple description of the process of death. In this situation, the certifier should try to provide an initiating condition, qualify the causes about which he/she is uncertain, and be able to explain the certification chosen.

When conditions such as the following are reported, information about the etiology should be reported if possible:

Unknown	Low birthweight
Prematurity	Intrauterine hypoxia
Immaturity	

If the certifier is unable to determine the etiology of a process such as those shown above, the process must be qualified as being of an unknown, undetermined, probable, presumed, or unspecified etiology so it is clear that a distinct etiology was not inadvertently or carelessly omitted.

Mechanisms of death

Mechanistic terminal events such as respiratory failure preferably should not be the initiating cause in a cause-of-death statement. Please enter the condition that triggered the events resulting in this terminal event as the initiating cause.

Completing the Report of Fetal Death

These instructions pertain to the 2003 revision of the U.S. Standard Report of Fetal Death. Information for the U.S. Standard Report of Fetal Death is collected using worksheets (see [appendixes D and E](#)). Although the hospital usually completes the facility worksheet and the mother completes the patient's worksheet, under certain circumstances the medical examiner or coroner may be responsible for completing them (22). Therefore, instructions for completing all items on the worksheets are included; information on the worksheets subsequently is transferred to the report form.

FACILITY WORKSHEET

These instructions pertain to the 2003 revision of the U.S. Standard Report of Fetal Death. Information needed to complete the facility worksheet should come from the medical records. Please see the "Guide to Completing the Facility Worksheets for the Certificate of Live Birth and Report of Fetal Death" for more detailed instructions (21).

1. Facility name (If not institution, give street and number)

Type or print the name of the facility where the fetal death occurred. If this fetal death did not occur in a hospital or freestanding birthing center, type or print the street and number of the place where the fetal death occurred. If the fetal death occurred en route, (that is, in a moving conveyance), type or print the city, town, village, or location where the fetus was first removed from the conveyance. If the fetal death occurs in international airspace or waters, enter "plane" or "boat."

2. Facility I.D.

Print the facility's National Provider Identification Number (NPI) or, if no NPI, the State hospital code.

3. City, Town, or Location of delivery

Type or print the name of the city, township, village or other location where the fetal death occurred. If the fetal death occurred in international waters or airspace, enter the location where the fetus was first removed from the boat or plane.

4. County of delivery

Type or print the name of the county where the fetal death occurred. If the fetal death occurred in international waters or airspace, enter the name of the county where the fetus was first removed from the boat or plane.

5. Place of delivery

Check the box that best describes the type of place where the fetal death occurred. If the type of place is not known, type or print "unknown" in the space.

- ☐ Hospital
☐ Freestanding birthing center
☐ Home delivery
 Planned to deliver at home ☐ Yes ☐ No
☐ Clinic/Doctor's Office
☐ Other (specify) _____

Items 1–5 identify the place of delivery, which is used to study relationships of hospital and nonhospital pregnancy terminations. It is also used by many States to produce statistical data by specific facility. Information on place of delivery, together with residence information, provides data to evaluate the utilization and distribution of health services.

6a. Date of first prenatal care visit (Prenatal care begins when a physician or other health professional first examines and/or counsels the pregnant woman as part of an ongoing program of care for the pregnancy)

Print or type the month, day, and year of the first prenatal care visit. Complete all parts of the date that are available; leave the rest blank.

If it is not known whether the patient had prenatal care, or if she had care but the date of the first visit is not known, write "unknown."

If the patient had no prenatal care, check the "no prenatal care" box and leave the date blank.

This item identifies when during the pregnancy the patient entered prenatal care and is needed as the basis for measures of how soon patients initiate prenatal care and for measures of the appropriate utilization of services. This information is also used to study the impact of prenatal care on pregnancy outcome.

6b. Date of last prenatal care visit (Enter the date of the last visit recorded in the patient's prenatal records)

Print or type the month, day, and year of the last prenatal care visit recorded in the records. Complete all parts of the date that are available; leave the rest blank.

If it is not known whether the patient had prenatal care, or if she had care but the date of the last visit is not known, write "unknown."

If the patient had no prenatal care, check the "no prenatal care" box and leave the date blank.

7. Total number of prenatal care visits for this pregnancy (Count only those visits in the record. If none, enter "0.")

If the patient had no prenatal care, type or print "0" in the space. Note: the "no prenatal care" box should also be checked in items 6a and 6b.

If the patient had prenatal care but the number of visits is not known, type or print "unknown" in the space.

Type or print the total number of prenatal care visits for this pregnancy in this space.

This item is needed as the basis for measures of utilization of prenatal care services. It is also used in conjunction with "Date of First Prenatal Care Visit" to assess the adequacy of prenatal care.

8. Date last normal menses began

Print or type all parts of the date that the patient's last normal menses began.

If no parts of the date are known, write in "unknown."

This item provides information on the length of gestation, which can be associated with weight of fetus to determine the maturity of the fetus at delivery. It is also associated with infant morbidity and mortality, and is important in medical research.

9. Number previous live births now living (For multiple deliveries, includes live born infants born before this fetus in the multiple set)

When completing this item, do not include this fetal death; include all previous live-born infants. For multiple deliveries, include all live-born

infants preceding this fetal death in the delivery. If first delivered in a multiple delivery, do not include this fetus. If second delivered, include the first live born, etc.

Type or print the number of previous born infants still living in item 9.

The information in items 9–14 are essential for determining live-birth and total-birth order, which are important in studying trends in childbearing and child spacing. The information is useful in studying health problems associated with birth order. The dates of last live birth and last other pregnancy outcome permit the calculation of intervals between live births and fetal deaths and between pregnancies. This information allows researchers to analyze the relationship of various maternal characteristics and pregnancy outcomes with birth and pregnancy intervals.

10. Number of previous live births now dead (For multiple deliveries, includes live born infants born before this fetus in the multiple set who subsequently died)

When completing this item, do not include this fetal death but include all previous live-born infants who are now dead.

Please type or print the number of infants born alive but now dead in item 10.

11. Date of last live birth

If the date of delivery is not known, type or print “unknown” in the space.

12. Total number of other pregnancy outcomes (Include fetal losses of any gestational age—spontaneous losses, induced losses, and/or ectopic pregnancies. If this was a multiple delivery, include all fetal losses delivered before this fetus in the pregnancy.)

If there were none, check the “none” box. If the number is unknown, type or print “unknown” in the space.

13. Date of last other pregnancy outcome (Date when last pregnancy which did not result in a live birth ended)

If the date of the event is not known, type or print “unknown” in the space.

14. Risk factors in this pregnancy

The patient may have more than one risk factor; check all that apply. If the patient had none of the risk factors, check the “none of the above” box.

If it is unknown whether the patient had any of the risk factors, type or print unknown.

Diabetes - (Glucose intolerance requiring treatment)

☐ Prepregnancy - (Diagnosis prior to this pregnancy)

☐ Gestational - (Diagnosis in this pregnancy)

Hypertension - (Elevation of blood pressure above normal for age, gender, and physiological condition)

☐ Prepregnancy (Chronic) - (Diagnosis prior to this pregnancy)

☐ Gestational - (PIH, preeclampsia) (Diagnosis during this pregnancy)

☐ Eclampsia - (Diagnosis during this pregnancy)

☐ Previous preterm births - (History of pregnancy(ies) terminating in a live birth of less than 37 completed weeks of gestation)

☐ Other previous poor pregnancy outcome - (Includes perinatal death, small for gestational age/intrauterine growth restricted birth) (History of pregnancies continuing into the 20th week of gestation and resulting in any of the listed outcomes. Perinatal death includes fetal and neonatal deaths.)

☐ Pregnancy resulted from infertility treatment - (Any assisted reproduction treatment whether artificial insemination, drugs (e.g., Clomid, Pergonal) or technical procedures (e.g., in vitro fertilization) used to initiate the pregnancy)

☐ Patient had a previous cesarean delivery - (Previous operative delivery by extraction of the fetus, placenta and membranes through an incision in the maternal abdominal and uterine walls)

If Yes, how many _____

☐ None of the above

The risk factors contribute to the national data set and provide more specific information regarding fetal death events. For example, diabetes information is associated with macrosomia, cesarean delivery, metabolic abnormalities, and congenital anomalies. Management during pregnancy can reduce poor maternal and infant outcomes. Hypertension is associated with increased risk for preterm delivery, intrauterine growth restriction, maternal and perinatal morbidity and mortality. Vaginal bleeding during the pregnancy prior to the onset of labor is associated with increased risk for multiple adverse pregnancy outcomes. Pregnancy resulting from infertility treatment increases the incidence of multiple births.

15. Infections present and/or treated during this pregnancy (Present at start of pregnancy or confirmed diagnosis during pregnancy with or without documentation of treatment)

If the prenatal record is not available and the information is not available from other medical records, write "unknown" in the space. More than one infection may be checked.

- ☐ Gonorrhea - (a diagnosis of or positive test for *Neisseria gonorrhoeae*)
- ☐ Syphilis - (also called lues - a diagnosis of or positive test for *Treponema pallidum*)
- ☐ Chlamydia - (a diagnosis of or positive test for *Chlamydia trachomatis*)
- ☐ Listeria (LM) - (a diagnosis of or positive test for *Listeria monocytogenes*)
- ☐ Group B Streptococcus (GBS) - (a diagnosis of or positive test for *Streptococcus agalactiae* or group B streptococcus)
- ☐ Cytomegalovirus (CMV) - (a diagnosis of or positive test for *cytomegalovirus*)
- ☐ Parvo virus (B19) - (a diagnosis of or positive test for parvovirus B19)
- ☐ Toxoplasmosis (Toxo) - (a diagnosis of or positive test for *Toxoplasma gondii*)
- ☐ None of the above
- ☐ Other (specify) _____

All of the listed infections are known to cause concomitant fetal and/or subsequent neonatal infection and thus have significant public health implications. In addition, there is no current national reporting system for these infections that focuses on the prevalence of perinatal transmission.

16. Date of delivery

Print or type the month, day, and 4-digit year. Standard numeric abbreviations are acceptable.

This item is used in conjunction with the date the last normal menses began to calculate the length of gestation, which is an essential element in the study of low birth weight deliveries.

17. Time of delivery

Print or type the hour and minute of birth using a 24-hour clock. If the time of delivery is not known, enter "unknown" in the space. The time recorded should be the exact time when the delivery is complete.

This item documents the exact time of delivery for various legal uses, such as the order of delivery in plural deliveries. When the delivery occurs around

midnight, the exact hour and minute may affect the date of death. For deliveries occurring at the end of the year, the hour and minute affect not only the day but also the year of death.

18. Name and title of person completing report

This item is to be completed by the facility. If the delivery did not occur in a facility, it is to be completed by the attendant or certifier.

Please print or type the name of the person who attended the delivery and their National Provider Identification (NPI) number.

If the attendant does not have an NPI number, type or print “none.” If the attendant should have an NPI number but it is unknown, type or print “unknown.”

19. Date report completed

Print or type the month, day, and 4-digit year. Standard numeric abbreviations are acceptable.

20. Was the mother transferred to this facility for maternal medical or fetal indications for delivery? (Transfers include hospital to hospital, birth facility to hospital, etc.)

Check “Yes” if the patient was transferred from another facility to this one, and enter the name of the facility. If the name of the facility is not known, print or type “unknown.”

21. Attendant’s name, title, and NPI

The attendant at delivery is the individual physically present at the delivery who is responsible for the delivery. For example, if an intern or nurse-midwife delivers a fetus under the supervision of an obstetrician who is present in the delivery room, the obstetrician is to be reported as the attendant.

Please print or type the name of the person who attended the delivery and their NPI number.

If the attendant does not have an NPI number, type or print “none.” If the attendant should have an NPI number but it is unknown, type or print “unknown.”

Check one box to specify the attendant's title. If the "Other (Specify)" box is checked, please print or type the title of the attendant. Examples include: nurse, father, police officer, EMS technician, etc.

- ☐ M.D.
☐ D.O.
☐ CNM/CM - (Certified Nurse Midwife/Certified Midwife)
☐ Other Midwife - (Midwife other than CNM/CM)
☐ Other (specify) _____

22. Mother's weight at delivery

If the patient delivery weight is unknown, print or type "unknown" in the item's space.

Record weight in whole pounds only. Do not include fractions.

23a–e. METHOD OF DELIVERY (The physical process by which the complete delivery of the fetus was effected) (Complete 23a, b, c, d, and e)

A response to each section is required.

If any of the information for an individual section is not known at this time, print or type "unknown" in the space for that particular section.

23a. Was delivery with forceps attempted but unsuccessful? (Obstetric forceps were applied to the fetal head in an unsuccessful attempt at vaginal delivery.)

- ☐ Yes ☐ No

23b. Was delivery with vacuum extraction attempted but unsuccessful? (Ventouse or vacuum cup was applied to the fetal head in an unsuccessful attempt at vaginal delivery.)

- ☐ Yes ☐ No

23c. FETAL PRESENTATION AT DELIVERY (Check one)

- ☐ Cephalic - (Presenting part of the fetus as vertex, occiput anterior (OA), occiput posterior (OP))
☐ Breech - (Presenting part of the fetus as breech, complete breech, frank breech, footling breech)
☐ Other - (Any other presentation not listed above)

23d. Final route and method of delivery (Check one)

- ☐ Vaginal/Spontaneous - (Delivery of the entire fetus through the vagina by the natural force of labor with or without manual assistance from the delivery attendant.)
- ☐ Vaginal/Forceps - (Delivery of the fetal head through the vagina by application of obstetrical forceps to the fetal head.)
- ☐ Vaginal/Vacuum - (Delivery of the fetal head through the vagina by application of a vacuum cup or ventouse to the fetal head.)
- ☐ Cesarean - (Extraction of the fetus, placenta and membranes through an incision in the maternal abdominal and uterine walls.)
- If cesarean, was a trial of labor attempted? (Labor was allowed, augmented or induced with plans for a vaginal delivery.)
- ☐ Yes ☐ No

23e. Hysterotomy/Hysterectomy

A hysterotomy is an incision into the uterus extending into the uterine cavity. It may be performed vaginally or transabdominally. A hysterotomy is applicable to fetal deaths only.

A hysterectomy is the surgical removal of the uterus, which may be performed abdominally or vaginally.

- ☐ Yes ☐ No

The data collected in items 23a-e provide information on current obstetric practices and outcomes. Attempted forceps/attempted vacuum data are needed to evaluate indications for cesarean delivery and for correlation with reported adverse neonatal outcomes. The final route and method of delivery portion will allow for a more complete report of the obstetric intervention used to effect delivery. Cesarean data are needed to evaluate the impact of the current emphasis on vaginal delivery in pregnancies subsequent to a cesarean delivery.

24. Maternal morbidity (Serious complications experienced by the patient associated with labor and delivery) (Check all that apply)

- ☐ Maternal transfusion - (Includes infusion of whole blood or packed red blood cells associated with labor and delivery.)
- ☐ Third or fourth degree perineal laceration - (3° laceration extends completely through the perineal skin, vaginal mucosa, perineal body and anal sphincter. 4° laceration is all of the above with extension through the rectal mucosa.)
- ☐ Ruptured uterus - (Tearing of the uterine wall.)
- ☐ Unplanned hysterectomy - (Surgical removal of the uterus that was not planned prior to admission. Includes anticipated but not definitively planned hysterectomy.)
- ☐ Admission to intensive care unit - (Any admission of the patient to a facility/unit designated as providing intensive care.)

- ☐ Unplanned operating room procedure following delivery - (Any transfer of the patient back to surgical area for an operative procedure that was not planned prior to admission for delivery. Excludes postpartum tubal ligations.)
- ☐ None of the above

This item has been added to the report because there is currently no national system of data collection on maternal morbidity and thus no easy mechanism for correlating pregnancy factors on a national basis. Several of the elements included are currently used as clinical quality indicators in various accreditation systems. Having a national database expands the information for assessing perinatal health care delivery systems. Third or fourth degree perineal laceration information may have implications for future problems with anal incontinence—especially for older patients. Ruptured uterus data may indicate whether there are increases in incidences related to vaginal birth after previous c-section. Unplanned hysterectomy, admission to intensive care unit, and unplanned procedure following delivery data are useful for quality assurance purposes.

25. Weight of fetus (Grams) (Do not convert lb/oz to grams)

Wherever possible, weigh and report the fetus' weight in grams. Report weight in pounds and ounces (lb/oz) only if weight in grams is not available. DO NOT convert weight from lb/oz to grams. Please specify whether grams or lb/oz are used.

If the birthweight is not known, print or type "unknown" in the space.

This is the single most important characteristic associated with the viability of the fetus. It is also related to prenatal care, marital status, socioeconomic status, and other factors associated with the delivery of the fetus. It is useful in evaluating the effectiveness of health care.

26. Obstetric estimate of gestation at delivery (Completed weeks)

Please enter the obstetric estimate of the fetus' gestation.

If the obstetric estimate of gestation is unknown, print or type "unknown" in the space. Do not complete this item based on the fetus' date of delivery and the patient's date of LMP.

This item is intended to provide an alternate estimate of gestational age when the date last normal menses began is missing or apparently incompatible with the weight of the fetus.

27. Sex

Print or type whether the fetus is male, female, or if the sex of the fetus is not yet determined. If the sex is unknown print or type "unknown" in the space.

This information is used to measure fetal and perinatal mortality by sex. This information helps identify differences in the impact of environmental and biological factors between the sexes.

28. Plurality

Print or type the plurality of this pregnancy (e.g., single, twin, triplet, etc.). Include all products of the pregnancy, that is, all live births and fetal deaths delivered at any point during the pregnancy. ("Reabsorbed" fetuses, those which are not "delivered"—expulsed or extracted from the patient—should not be counted.)

29. Set order (IF NOT SINGLE DELIVERY)

If this is a singleton delivery, leave this item blank. For multiple deliveries, print the order that this fetus was delivered in the set, e.g., first, second, third, etc. Count all live births and fetal deaths at any point in the pregnancy.

30. If not single delivery, specify number of fetal deaths in this delivery

If this is a singleton delivery, leave this item blank. For multiple deliveries, print or type the number of fetal deaths in this delivery.

The information from items 28–30 is used to study survival differences for multiple births based on order of delivery.

31. Congenital anomalies of the fetus (Malformations of the fetus diagnosed prenatally or after delivery) (Check all that apply)

Anomalies diagnosed should be recorded regardless of whether they contributed to fetal death.

- ☐ Anencephaly - (Partial or complete absence of the brain and skull. Also called anencephalus, acrania, or absent brain. Also includes fetuses with craniorachischisis (anencephaly with a contiguous spine defect).)
- ☐ Meningomyelocele/Spina bifida - (Spina bifida is herniation of the meninges and/or spinal cord tissue through a bony defect of spine closure. Meningomyelocele is herniation of meninges and spinal cord tissue. Meningocele (herniation of the meninges without spinal cord tissue) should also be included in this category. Both open and closed (covered with skin) lesions should be included. Do not include Spina bifida occulta (a midline bony spine defect without protrusion of the spinal cord or meninges).)
- ☐ Cyanotic congenital heart disease - (Congenital heart defects which cause cyanosis. Includes but is not limited to: transposition of the great arteries (vessels), tetralogy of Fallot, pulmonary or pulmonic valvular atresia, truncus arteriosus, total/partial anomalous pulmonary venous return with or without obstruction.)
- ☐ Congenital diaphragmatic hernia - (Defect in the formation of the diaphragm allowing herniation of abdominal organs into the thoracic cavity.)

- ☐ Omphalocele - (A defect in the anterior abdominal wall, accompanied by herniation of some abdominal organs through a widened umbilical ring into the umbilical stalk. The defect is covered by a membrane (different from gastroschisis, see below), although this sac may rupture. Also called exomphalos. Do not include umbilical hernia (completely covered by skin) in this category.)
- ☐ Gastroschisis - (An abnormality of the anterior abdominal wall, lateral to the umbilicus, resulting in herniation of the abdominal contents directly into the amniotic cavity. Differentiated from omphalocele by the location of the defect and absence of a protective membrane.)
- ☐ Limb reduction defect (excluding congenital amputation and dwarfing syndromes) - (Complete or partial absence of a portion of an extremity associated with failure to develop.)
- ☐ Cleft Lip with or without Cleft Palate - (Incomplete closure of the lip. May be unilateral, bilateral, or median.)
- ☐ Cleft Palate alone - (Incomplete fusion of the palatal shelves. May be limited to the soft palate or may extend into the hard palate. Cleft palate in the presence of cleft lip should be included in the "Cleft Lip with or without Cleft Palate" category above.)
- ☐ Downs Syndrome (Trisomy 21)
 - ☐ Karyotype confirmed
 - ☐ Karyotype pending
- ☐ Suspected chromosomal disorder - (Includes any constellation of congenital malformations resulting from or compatible with known syndromes caused by detectable defects in chromosome structure.)
 - ☐ Karyotype confirmed
 - ☐ Karyotype pending
- ☐ Hypospadias - (Incomplete closure of the male urethra resulting in the urethral meatus opening on the ventral surface of the penis. Includes first degree on the glans ventral to the tip, second degree in the coronal sulcus, and third degree on the penile shaft.)
- ☐ None of the anomalies listed above.

The items selected for this section will provide more specific information regarding fetal death events. Identifying the conditions and contributing causes of fetal death is necessary to understanding why they occur and may lead to possible prevention of fetal loss in the future.

32. Method of disposition

- ☐ Burial
- ☐ Cremation
- ☐ Hospital Disposition
- ☐ Donation
- ☐ Removal from State
- ☐ Other (Specify) _____

Check the box corresponding to the method of disposition of the fetus.

This information indicates whether the fetus was disposed of as required by law. It also serves to help locate the fetus in case exhumation, autopsy, or transfer is required later.

33–34. CAUSE OF FETAL DEATH

Detailed instructions for the cause of fetal death section, together with examples of properly completed records, are contained in the section on completing the cause of fetal death. These items are to be completed by the person whose name appears in item 21.

The cause-of-death section consists of two parts. The initiating cause/condition (item 33) is for reporting a single condition that most likely began the sequence of events resulting in the death of the fetus. Other significant causes or conditions (item 34) include all other conditions contributing to death. These conditions may be triggered by the initiating cause (item 33) or causes that are not among the sequence of events triggered by the initiating cause (item 33).

The cause-of-death information should be the certifier's best medical opinion. Report a specific condition in the space most appropriate to the given situation. A condition can be listed as "probable" if it has not been definitively diagnosed. In reporting the causes of fetal death, conditions in the fetus or mother, or of the placenta, cord, or membranes, should be reported if they are believed to have adversely affected the fetus.

Cause of fetal death should include information provided by the pathologist if an autopsy or other type of postmortem examination was done. If microscopic examinations for a fetal death are still pending at the time the report is filed, the medical examiner or coroner should report the additional information as soon as it is available.

This item provides medical information for ranking causes of fetal death and for analyzing the conditions leading to fetal death. Information on cause of fetal death is correlated with information from other items on the report, such as length of gestation and prenatal care.

35. Was an autopsy performed?

Enter "Yes" if a partial or complete autopsy was performed. Otherwise, enter "No."

An autopsy is important in giving additional insight into the conditions that led to death. This additional information is particularly important when the cause is not immediately clear.

36. Was a histological placental examination performed?

Enter "Yes" if any histological placental examination was performed. Otherwise, enter "No."

A histological placental examination provides additional information about the conditions that led to death. This may provide insight into the appropriate causes of death to report.

37. Were autopsy or histological placental examination results used in determining the cause of fetal death?

If "No" is checked for both 35 and 36, leave 37 blank. If "Yes" is checked for either 35 or 36, complete item 37.

This information assists in determining whether information was available to assist in ascertaining the cause of death. Knowing whether the exam results were available gives insight into the quality of the cause-of-death data.

38. Estimated time of fetal death

Indicate when the fetus died by specifying one choice:

- ☐ Dead at time of first assessment, no labor ongoing
- ☐ Dead at time of first assessment, labor ongoing
- ☐ Died during labor, after first assessment
- ☐ Unknown time of fetal death

This item is used as a check to ensure that the delivery was properly reported as a fetal death and was not a live birth. It also gives information on care.

PATIENT'S WORKSHEET FOR THE REPORT OF FETAL DEATH

1. NAME OF INFANT/FETUS (OPTIONAL) First, Middle, Last, Suffix

2. CURRENT LEGAL NAME OF PATIENT

Type or print the first, middle, and last name of the patient. This is the patient's current legal name.

3. USUAL LOCATION OF PATIENT'S HOUSEHOLD/RESIDENCE

These items refer to the patient's residence address, not her postal address. Do not include post office boxes or rural route numbers.

If the patient is a U.S. resident, print the U.S. State or territory where the patient lives. If the patient is a U.S. resident, do not record "U.S."

If the patient is a Canadian resident, print the name of the province or territory followed by "/ Canada."

If the patient is not a resident of the United States, its territories, or Canada, print the name of the patient's country of residence.

Print the county, city or town or location where the patient lives. If the patient is not a U.S. resident, leave these items blank.

Print the patient's street name and number, apartment or room number, and ZIP Code. If the patient is not a U.S. resident, leave these items blank. For the street name, be sure to include any prefixes, directions, and apartment numbers.

Examples: South Main Street
 Walker Street NW

4. INSIDE CITY LIMITS?

Check whether the patient's residence is inside of city or town limits. If it is not known if the residence is inside the city limits, print "unknown."

If the patient is not a U.S. resident, leave this item blank.

5. PATIENT'S MAILING ADDRESS

This item refers to the patient's postal address. Be sure to include post office boxes or rural route numbers.

If the patient is a U.S. resident, print the U.S. State or territory where the patient gets her mail. If the address is in the United States, do not record "U.S."

If the patient is a Canadian resident, print the name of the province or territory followed by "/ Canada."

If the patient is not a resident of the United States, its territories, or Canada, print the name of the patient's country of residence.

Print the county, city or town, or location where the patient lives. If the patient is not a U.S. resident, leave these items blank.

Print the patient's street name and number, apartment or room number, and ZIP Code. If the patient is not a U.S. resident, leave these items blank.

For the street name, be sure to include any prefixes, directions, and apartment numbers.

Examples: South Main Street
 Walker Street NW

6. PATIENT'S BIRTHDATE

Print or type the month, day, and 4-digit year of birth. Standard numeric abbreviations are acceptable.

7. PATIENT'S BIRTHPLACE

Print or type the name of the U.S. State or territory in which the patient was born. If she was born outside of the United States, print or type the name of the country in which she was born. United States territories are Puerto Rico, U.S. Virgin Islands, Guam, American Samoa, and Northern Marianas. If the patient's birthplace is not known, print or type "unknown" in the space. (NOTE: Canadian provinces and territories are not individually identified for place of birth.)

8. PATIENT'S EDUCATION

Check the box that best describes the highest degree or level of schooling completed at the time of delivery. If no box is checked, write "unknown" in the space.

- ☐ 8th grade or less
- ☐ 9th–12th grade; no diploma
- ☐ High school graduate or GED completed
- ☐ Some college credit, but no degree
- ☐ Associate degree (eg., AA, AS)
- ☐ Bachelor's degree (eg., BA, AB, BS)
- ☐ Master's degree (eg., MA, MS, MEng, MEd, MSW, MBA)
- ☐ Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD)

Education is highly related to fertility, health practices, and pregnancy outcome. It is also used as an indicator of socioeconomic status.

9. HISPANIC ORIGIN

Based on the patient's response, enter all the corresponding boxes and fill in any literal (written) responses on the worksheet. The patient is encouraged to select only one response. If the patient has chosen more than one response, check all that she has selected. For example, if both Mexican and Cuban are selected, check both responses. If the patient indicates an ethnic origin not on the list, record it in the "Specify" space. Enter the patient's response in this space even if it is not a Hispanic origin. If the patient did not respond, type or print "unknown." Check the "No" box if the patient is not Spanish/Hispanic/Latina.

- ☐ No, not Spanish/Hispanic/Latina
- ☐ Yes, Mexican, Mexican American, Chicana
- ☐ Yes, Puerto Rican
- ☐ Yes, Cuban
- ☐ Yes, Other Spanish/Hispanic/Latina (e.g., Spaniard, Salvadoran, Dominican, Columbian) (Specify) _____

Each question, Race and Hispanic origin, should be asked independently. "Hispanic" is not a race, and a decedent of Hispanic origin may be of any race. Do not leave item 9 blank. "Hispanic" is a self-designated classification for people whose origins are from Spain, the Spanish-speaking countries of Central or South America, the Caribbean, or those identifying themselves generally as Spanish or Spanish American. Origin can be viewed as ancestry, nationality, or country of birth of the person or person's parents or ancestors prior to their arrival in the United States. Although the prompts include the major Hispanic groups, other groups may be specified under "Other."

10. RACE

Based on the patient's response, select all the corresponding boxes on the worksheet and fill in any literal (written) responses exactly as given

regardless of whether or not any boxes are marked. If more than one response has been chosen, check all selected; for example, if both "Black" and "Chinese" are checked, select both responses. If there is no response, type or print "unknown."

- ☐ White
- ☐ Black or African American
- ☐ American Indian or Alaskan Native
(name of enrolled or principal tribe) _____
- ☐ Asian Indian
- ☐ Chinese
- ☐ Filipino
- ☐ Japanese
- ☐ Korean
- ☐ Vietnamese
- ☐ Other Asian (specify) _____
- ☐ Native Hawaiian
- ☐ Guamanian or Chamorro
- ☐ Samoan
- ☐ Other Pacific Islander (specify) _____
- ☐ Other (specify) _____

Each question, Race and Hispanic origin, should be answered independently. Do not leave item 10 blank. If there is no box for the response, check the "Other" box, and enter the response even if it is not a race.

American Indian and Alaska Native refer only to those native to North and South America (including Central America) and does not include Asian Indian. Please specify the name of enrolled or principal tribe (e.g., Navajo, Cheyenne, etc.) for the American Indian or Alaska Native.

For Asians and Pacific Islanders, enter the national origin of the patient. For Asians check Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, or specify other Asian group; for Pacific Islanders check Native Hawaiian, Guamanian or Chamorro, Samoan, or specify Other Pacific Islander.

If more than one race is indicated, enter each race (e.g., Samoan-Chinese-Filipino or White, American Indian).

11. PATIENT EVER MARRIED?

- ☐ Yes
- ☐ No

12. PATIENT'S NAME PRIOR TO FIRST MARRIAGE

First, Middle, Last, Suffix

13. WAS PATIENT MARRIED DURING PREGNANCY?

☐ Yes

☐ No

If the patient is currently married or married at time of conception or any time between conception and the fetal death, check the "Yes" box.

If the patient is not currently married or was not married at the time of conception or any time between conception and the fetal death, check the "No" box.

The information on marital status in items 11–13 is used to monitor the substantial differences in fertility patterns and pregnancy outcomes for married and unmarried women. This information can help to identify the need for additional supportive public health and other services.

14. LEGAL NAME OF BABY'S FATHER

First, Middle, Last, Suffix

15. FATHER'S DATE OF BIRTH

Print or type the month, day, and 4-digit year of birth.

If the father's Date of Birth is unknown, print "unknown." If part of the Date of Birth is unknown, enter the known parts and leave the remaining parts blank.

16. FATHER'S BIRTHPLACE

Print or type the name of the U.S. State or territory in which the father was born. If he was born outside of the United States, print or type the name of the country in which he was born. U.S. territories are Puerto Rico, U.S. Virgin Islands, Guam, American Samoa, and Northern Marianas. If the father's birthplace is not known, print or type "unknown" in the space. (NOTE: Canadian provinces and territories are not individually identified for his place of birth.)

17. DID PATIENT RECEIVE WIC (WOMEN, INFANTS and CHILDREN) FOOD FOR HERSELF DURING THIS PREGNANCY?

This item is to be completed based on information obtained from the patient. Either the "Yes" or "No" box must be checked.

If the patient's worksheet indicates "unknown," print or type "unknown."

This item was added as an indicator of program participation as well as socioeconomic status. WIC is the nutrition program for Women, Infants, and Children and gives pregnant women and/or their children food, checks, or vouchers for food.

18. PATIENT'S HEIGHT

Enter the patient's height in feet and inches. If the record indicates height in fractions such as 5 feet 6 and one-half inches, truncate and enter 5 feet, 6 inches.

If the patient's height is unknown, print or type "unknown" in the space.

19. PATIENT'S PREPREGNANCY WEIGHT

If the patient's prepregnancy weight is unknown, print or type "unknown" in the item's space.

Record weight in whole pounds only; do not include fractions.

20. CIGARETTE SMOKING BEFORE AND DURING PREGNANCY

This item is to be completed by the facility based on information obtained from the patient. If the delivery did not occur in a facility, it is to be completed by the attendant or certifier based on information obtained from the patient.

If the patient's worksheet indicates "unknown" or "refused," print or type "unknown." Enter either the average number of cigarettes or the average number of packs of cigarettes smoked for each time period. If none, enter "0."

	# of cigarettes		# of packs
3 months before pregnancy	_____	OR	_____
first 3 months of pregnancy	_____	OR	_____
second 3 months of pregnancy	_____	OR	_____
last 3 months of pregnancy	_____	OR	_____

This item provides information on changes in tobacco use before and during pregnancy, which has an important impact on pregnancy outcome.

Any use of trade names in this handbook is for identification purposes only and does not imply endorsement by the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

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Appendix A

U.S. Standard Certificate of Death

U.S. STANDARD CERTIFICATE OF DEATH

LOCAL FILE NO.				STATE FILE NO.			
1. DECEDENT'S LEGAL NAME (Include AKA's if any) (First, Middle, Last) John Leonard Palmer						2. SEX Male	3. SOCIAL SECURITY NUMBER 123-45-6789
4a. AGE-Last Birthday (Years) 92	4b. UNDER 1 YEAR Months Days	4c. UNDER 1 DAY Hours Minutes	5. DATE OF BIRTH (Mo/Day/Yr) April 23, 1911		6. BIRTHPLACE (City and State or Foreign Country) San Francisco, CA		
7a. RESIDENCE-STATE Maryland		7b. COUNTY Frederick		7c. CITY OR TOWN Thurmont			
7d. STREET AND NUMBER 245 Lone View Road			7e. APT. NO.	7f. ZIP CODE 20212-1234	7g. INSIDE CITY LIMITS? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
8. EVER IN US ARMED FORCES? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		9. MARITAL STATUS AT TIME OF DEATH <input checked="" type="checkbox"/> Married <input type="checkbox"/> Married, but separated <input type="checkbox"/> Widowed <input type="checkbox"/> Divorced <input type="checkbox"/> Never Married <input type="checkbox"/> Unknown		10. SURVIVING SPOUSE'S NAME (If wife, give name prior to first marriage) Sheila Marie Sonner			
11. FATHER'S NAME (First, Middle, Last) Stanley Leonard Palmer			12. MOTHER'S NAME PRIOR TO FIRST MARRIAGE (First, Middle, Last) Lorraine Ellen Russell				
13a. INFORMANT'S NAME Sheila Marie Palmer		13b. RELATIONSHIP TO DECEDENT Wife		13c. MAILING ADDRESS (Street and Number, City, State, Zip Code) 245 Lone View Road, Thurmont, MD 20212-1234			
14. PLACE OF DEATH (Check only one; see instructions) <input checked="" type="checkbox"/> IF DEATH OCCURRED IN A HOSPITAL: <input type="checkbox"/> IF DEATH OCCURRED SOMEWHERE OTHER THAN A HOSPITAL: <input type="checkbox"/> Inpatient <input type="checkbox"/> Emergency Room/Outpatient <input type="checkbox"/> Dead on Arrival <input type="checkbox"/> Hospice facility <input type="checkbox"/> Nursing home/Long term care facility <input type="checkbox"/> Decedent's home <input type="checkbox"/> Other (Specify):							
15. FACILITY NAME (If not institution, give street & number) Mountain Memorial Hospital			16. CITY OR TOWN, STATE, AND ZIP CODE Frederick		17. COUNTY OF DEATH Frederick		
18. METHOD OF DISPOSITION: <input checked="" type="checkbox"/> Burial <input type="checkbox"/> Cremation <input type="checkbox"/> Donation <input type="checkbox"/> Entombment <input type="checkbox"/> Removal from State <input type="checkbox"/> Other (Specify):			19. PLACE OF DISPOSITION (Name of cemetery, crematory, other place) Wesley Memorial Cemetery				
20. LOCATION-CITY, TOWN, AND STATE Frederick			21. NAME AND COMPLETE ADDRESS OF FUNERAL FACILITY Boone and Sons Funeral Home, 475 E. Main Street, Frederick, Maryland 20216-3456				
22. SIGNATURE OF FUNERAL SERVICE LICENSEE OR OTHER AGENT Robert J. Boone						23. LICENSE NUMBER (Of Licensee) 2569114	
24. DATE PRONOUNCED DEAD (Mo/Day/Yr) June 20, 2003				25. TIME PRONOUNCED DEAD 0310			
26. SIGNATURE OF PERSON PRONOUNCING DEATH (Only when applicable) Julia R. Kovar, M.D.				27. LICENSE NUMBER 624998075		28. DATE SIGNED (Mo/Day/Yr) June 20, 2003	
29. ACTUAL OR PRESUMED DATE OF DEATH (Mo/Day/Yr) (Spell Month) June 20, 2003			30. ACTUAL OR PRESUMED TIME OF DEATH 0300		31. WAS MEDICAL EXAMINER OR CORONER CONTACTED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
32. CAUSE OF DEATH (See instructions and examples) PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary. IMMEDIATE CAUSE (Final disease or condition resulting in death) a. Pulmonary embolism Due to (or as a consequence of): Minutes Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST b. Congestive heart failure Due to (or as a consequence of): 4 days c. Acute myocardial infarction Due to (or as a consequence of): 7 days d. Chronic ischemic heart disease 8 days PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I. Diabetes mellitus, Hypertension 33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No 34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No							
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown		36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year		37. MANNER OF DEATH <input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined			
38. DATE OF INJURY (Mo/Day/Yr) (Spell Month)		39. TIME OF INJURY		40. PLACE OF INJURY (e.g., Decedent's home, construction site; restaurant; wooded area)		41. INJURY AT WORK? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
42. LOCATION OF INJURY: State: City or Town: Apartment No.: Zip Code:				43. DESCRIBE HOW INJURY OCCURRED:			
44. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Pedestrian <input type="checkbox"/> Other (Specify):				45. CERTIFIER (Check only one): <input checked="" type="checkbox"/> Certifying physician: To the best of my knowledge, death occurred due to the cause(s) and manner stated. <input type="checkbox"/> Forensic/medical examiner: To the best of my knowledge, death occurred at the time, date, and place, and due to the cause(s) and manner stated. <input type="checkbox"/> Medical Examiner/Coroner: On the basis of examination, and/or investigation, in my opinion, death occurred at the time, date, and place, and due to the cause(s) and manner stated.			
Signature of certifier: Edward M. Stone, M.D. 46. NAME, ADDRESS, AND ZIP CODE OF PERSON COMPLETING CAUSE OF DEATH (Item 33) Edward Matthew Stone, M.D., 23 Porter Drive, Frederick, Maryland 20885-6789							

47. TITLE OF CERTIFIER M.D.		48. LICENSE NUMBER 1299654	49. DATE CERTIFIED (Mo/Day/Yr) June 22, 2003	50. FOR REGISTRAR ONLY- DATE FILED (Mo/Day/Yr) June 23, 2003
To Be Completed By: FUNERAL DIRECTOR	51. DECEDENT'S EDUCATION-Check the box that best describes the highest degree or level of school completed at the time of death. <input type="checkbox"/> 8th grade or less <input type="checkbox"/> 9th - 12th grade; no diploma <input type="checkbox"/> High school graduate or GED completed <input type="checkbox"/> Some college credit, but no degree <input type="checkbox"/> Associate degree (e.g., AA, AS) <input checked="" type="checkbox"/> Bachelor's degree (e.g., BA, AB, BS) <input type="checkbox"/> Master's degree (e.g., MA, MS, MEng, MEd, MSW, MBA) <input type="checkbox"/> Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD)		52. DECEDENT OF HISPANIC ORIGIN? Check the box that best describes whether the decedent is Spanish/Hispanic/Latino. Check the "No" box if decedent is not Spanish/Hispanic/Latino. <input checked="" type="checkbox"/> No, not Spanish/Hispanic/Latino <input type="checkbox"/> Yes, Mexican, Mexican American, Chicano <input type="checkbox"/> Yes, Puerto Rican <input type="checkbox"/> Yes, Cuban <input type="checkbox"/> Yes, other Spanish/Hispanic/Latino (Specify) _____	
	53. DECEDENT'S RACE (Check one or more races to indicate what the decedent considered himself or herself to be) <input checked="" type="checkbox"/> White <input type="checkbox"/> Black or African American <input checked="" type="checkbox"/> American Indian or Alaska Native (Name of the enrolled or principal tribe) <u>Cherokee</u> <input type="checkbox"/> Asian Indian <input type="checkbox"/> Chinese <input type="checkbox"/> Filipino <input type="checkbox"/> Japanese <input type="checkbox"/> Korean <input type="checkbox"/> Vietnamese <input type="checkbox"/> Other Asian (Specify) _____ <input type="checkbox"/> Native Hawaiian <input type="checkbox"/> Guamanian or Chamorro <input type="checkbox"/> Samoan <input type="checkbox"/> Other Pacific Islander (Specify) _____ <input type="checkbox"/> Other (Specify) _____			
	54. DECEDENT'S USUAL OCCUPATION (Indicate type of work done during most of working life. DO NOT USE RETIRED). Public accountant			
55. KIND OF BUSINESS/INDUSTRY Self-employed				

Appendix B

Decedent's Educational Level Selection Card

Decedent's Formal Education Level

What was the highest degree or level of school the decedent COMPLETED? Choose only ONE. If the decedent is currently enrolled, mark the previous grade or highest degree received.

- A.** 8th grade or less
- B.** 9th–12th grade; no diploma
- C.** High School Graduate or GED completed
- D.** Some college credit, but no degree
- E.** Associate Degree (e.g., AA, AS)
- F.** Bachelor's Degree (e.g., BA, AB, BS)
- G.** Master's Degree (e.g., MA, MS, MEng, MEd, MSW, MBA)
- H.** Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD)

Appendix C

Race and Hispanic Origin Selection Cards

Decedent's Hispanic Origin Selection Card

Please review all the responses below. Please pick the response that best describes whether the decedent is Spanish/Hispanic/Latino. Choose the NO response if the decedent is not Spanish/Hispanic/Latino.

- A.** No, Not Spanish/Hispanic/Latino
- B.** Yes, Mexican, Mexican American, Chicano
- C.** Yes, Puerto Rican
- D.** Yes, Cuban
- E.** Yes, Other Spanish/Hispanic/Latino

If your choice is E. (Other Spanish/Hispanic/Latino) please specify.

Decedent's Race(s) Selection Card

Decedent's Race(s)

Which item(s) below best describe what race(s) the decedent considered himself/herself to be? Select all that apply.

- A.** White
- B.** Black or African American
- C.** American Indian or Alaska Native
(Name of the enrolled or principal tribe)
- D.** Asian Indian
- E.** Chinese
- F.** Filipino
- G.** Japanese
- H.** Korean
- I.** Vietnamese
- J.** Other Asian—(Specify) _____
- K.** Native Hawaiian
- L.** Guamanian or Chamorro
- M.** Samoan
- N.** Other Pacific Islander—(Specify) _____
- O.** Other—(Specify) _____

Appendix D

U.S. Standard Report of Fetal Death

LOCAL FILE NO.		STATE FILE NUMBER			
MOTHER	1. NAME OF FETUS (optional-at the discretion of the parents)		2. TIME OF DELIVERY 0725 (24hr)	3. SEX (M/F/Unk) Male	4. DATE OF DELIVERY (Mo/Day/Yr) December 31, 2003
	5a. CITY, TOWN, OR LOCATION OF DELIVERY El Paso		7. PLACE WHERE DELIVERY OCCURRED (Check one) <input checked="" type="checkbox"/> Hospital <input type="checkbox"/> Freestanding birthing center <input type="checkbox"/> Home Delivery: Planned to deliver at home? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Clinic/Doctor's office <input type="checkbox"/> Other (Specify):		8. FACILITY NAME (if not institution, give street and number) Amsterdam Hospital
	5b. ZIP CODE OF DELIVERY 49205-3633				9. FACILITY ID. (NPI)
	6. COUNTY OF DELIVERY El Paso				
	10a. MOTHER'S CURRENT LEGAL NAME (First, Middle, Last, Suffix) Carmen Marie Ravoldo		10b. DATE OF BIRTH (mo/Day/Yr) July 25, 1980		
	10c. MOTHER'S NAME PRIOR TO FIRST MARRIAGE (First, Middle, Last, Suffix) Carmen Marie Sanchez		10d. BIRTHPLACE (State, Territory, or Foreign Country) New York City		
	11a. RESIDENCE OF MOTHER-STATE Texas		11b. COUNTY El Paso		
	11c. CITY, TOWN, OR LOCATION El Paso		11d. STREET AND NUMBER 2277 Gunpowder Drive		
	11e. APT. NO. 315		11f. ZIP CODE 49205-3630		
	11g. INSIDE CITY LIMITS? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
FATHER	12a. FATHER'S CURRENT LEGAL NAME (First, Middle, Last, Suffix) Jose Manwell Ravoldo		12b. DATE OF BIRTH (Mo/Day/Yr) September 9, 1974		12c. BIRTHPLACE (State, Territory, or Foreign Country) Texas
	13. METHOD OF DISPOSITION: <input checked="" type="checkbox"/> Burial <input type="checkbox"/> Cremation <input type="checkbox"/> Hospital Disposition <input type="checkbox"/> Donation <input type="checkbox"/> Removal from State <input type="checkbox"/> Other (Specify):				
DISPOSITION					
ATTENDANT AND REGISTRATION INFORMATION	14. ATTENDANT'S NAME, TITLE, AND NPI NAME: Edmund Matthew Stone, M.D. NPI: _____ TITLE: <input type="checkbox"/> MD <input type="checkbox"/> DO <input type="checkbox"/> CNM/CM <input type="checkbox"/> OTHER MIDWIFE <input type="checkbox"/> OTHER (Specify):		15. NAME AND TITLE OF PERSON COMPLETING REPORT Name: Julia Lynn Gonzalez Title: ART		16. DATE REPORT COMPLETED 12 / 31 / 2003 MM / DD / YYYY
					17. DATE RECEIVED BY REGISTRAR 01 / 01 / 2004 MM / DD / YYYY
CAUSE OF FETAL DEATH	18. CAUSE/CONDITIONS CONTRIBUTING TO FETAL DEATH				
	18a. INITIATING CAUSE/CONDITION (AMONG THE CHOICES BELOW, PLEASE SELECT THE ONE WHICH MOST LIKELY BEGAN THE SEQUENCE OF EVENTS RESULTING IN THE DEATH OF THE FETUS) Maternal Conditions/Diseases (Specify): <u>Severe pre-eclampsia</u>				
	18b. OTHER SIGNIFICANT CAUSES OR CONDITIONS (SELECT OR SPECIFY ALL OTHER CONDITIONS CONTRIBUTING TO DEATH IN ITEM 18a) Maternal Conditions/Diseases (Specify): _____				
	Complications of Placenta, Cord, or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruptio placentae <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify): _____				
	Other Obstetrical or Pregnancy Complications (Specify): _____				
	Fetal Anomaly (Specify): _____				
	Fetal Injury (Specify): _____				
	Fetal Infection (Specify): _____				
	Other Fetal Conditions/Disorders (Specify): <u>Intrauterine anoxia</u>				
	<input type="checkbox"/> Unknown				
Mother's Name Mother's Medical Record No.	18c. WEIGHT OF FETUS (grams preferred, specify unit) 400 <input checked="" type="checkbox"/> grams <input type="checkbox"/> lb/oz		18e. ESTIMATED TIME OF FETAL DEATH <input type="checkbox"/> Dead at time of first assessment, no labor ongoing <input type="checkbox"/> Dead at time of first assessment, labor ongoing <input checked="" type="checkbox"/> Died during labor, after first assessment <input type="checkbox"/> Unknown time of fetal death		18f. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Planned
	18d. OBSTETRIC ESTIMATE OF GESTATION AT DELIVERY 24 (completed weeks)				18g. WAS A HISTOLOGICAL PLACENTAL EXAMINATION PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Planned
DRAFT 03/11/2003					18h. WERE AUTOPSY OR HISTOLOGICAL PLACENTAL EXAMINATION RESULTS USED IN DETERMINING THE CAUSE OF FETAL DEATH? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Mother	19. MOTHER'S EDUCATION (Check the box that best describes the highest degree or level of school completed at the time of delivery)		20. MOTHER OF HISPANIC ORIGIN? (Check the box that best describes whether the mother is Spanish/Hispanic/Latina. Check the "No" box if mother is not Spanish/Hispanic/Latina)		21. MOTHER'S RACE (Check one or more races to indicate what the mother considers herself to be)	
	<input type="checkbox"/> 8th grade or less <input type="checkbox"/> 9th - 12th grade, no diploma <input checked="" type="checkbox"/> High school graduate or GED completed <input type="checkbox"/> Some college credit but no degree <input type="checkbox"/> Associate degree (e.g., AA, AS) <input type="checkbox"/> Bachelor's degree (e.g., BA, AB, BS) <input type="checkbox"/> Master's degree (e.g., MA, MS, MEd, MEd, MSW, MBA) <input type="checkbox"/> Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD)		<input type="checkbox"/> No, not Spanish/Hispanic/Latina <input type="checkbox"/> Yes, Mexican, Mexican American, Chicana <input checked="" type="checkbox"/> Yes, Puerto Rican <input type="checkbox"/> Yes, Cuban <input type="checkbox"/> Yes, other Spanish/Hispanic/Latina (Specify) _____		<input checked="" type="checkbox"/> White <input type="checkbox"/> Black or African American <input type="checkbox"/> American Indian or Alaska Native (Name of the enrolled or principal tribe) _____ <input type="checkbox"/> Asian Indian <input type="checkbox"/> Chinese <input type="checkbox"/> Filipino <input type="checkbox"/> Japanese <input type="checkbox"/> Korean <input type="checkbox"/> Vietnamese <input type="checkbox"/> Other Asian (Specify) _____ <input type="checkbox"/> Native Hawaiian <input type="checkbox"/> Guamanian or Chamorro <input type="checkbox"/> Samoan <input type="checkbox"/> Other Pacific Islander (Specify) _____ <input type="checkbox"/> Other (Specify) _____	
22. MOTHER MARRIED? (At delivery, conception, or anytime between) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		23a. DATE OF FIRST PRENATAL CARE VISIT (At delivery, conception, or anytime between) <input type="checkbox"/> No Prenatal Care		23b. DATE OF LAST PRENATAL CARE VISIT		24. TOTAL NUMBER OF PRENATAL VISITS FOR THIS PREGNANCY
23a. <u>08</u> / <u>03</u> / <u>2003</u> MM DD YYYY <input type="checkbox"/> No Prenatal Care		23b. <u>12</u> / <u>05</u> / <u>2003</u> MM DD YYYY		24. <u>5</u> (If none, enter "0")		
25. MOTHER'S HEIGHT <u>5 foot 3 inches</u> (feet/inches)		26. MOTHER'S PREGNANCY WEIGHT <u>120</u> (pounds)		27. MOTHER'S WEIGHT AT DELIVERY <u>133</u> (pounds)		28. DID MOTHER GET WIC FOOD FOR HERSELF DURING THIS PREGNANCY? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
29. NUMBER OF PREVIOUS LIVE BIRTHS		30. NUMBER OF OTHER PREGNANCY OUTCOMES (spontaneous or induced losses or ectopic pregnancies)		31. CIGARETTE SMOKING BEFORE AND DURING PREGNANCY		
29a. Now Living Number <u>1</u> <input type="checkbox"/> None		29b. Now Dead Number _____ <input checked="" type="checkbox"/> None		30a. Other Outcomes Number (Do not include this fetus) _____ <input checked="" type="checkbox"/> None		
29c. DATE OF LAST LIVE BIRTH <u>12</u> / <u>2000</u> MM YYYY		30b. DATE OF LAST OTHER PREGNANCY OUTCOME <u>07</u> / <u>21</u> / <u>2003</u> MM YYYY		31. CIGARETTE SMOKING BEFORE AND DURING PREGNANCY		
				For each time period, enter either the number of cigarettes or the number of packs of cigarettes smoked. IF NONE, ENTER "0". Average number of cigarettes or packs of cigarettes smoked per day. Three Months Before Pregnancy _____ # of cigarettes OR <u>1</u> # of packs First Three Months of Pregnancy _____ OR <u>1</u> # of packs Second Three Months of Pregnancy _____ OR <u>18</u> # of packs Last Three Months of Pregnancy _____ OR _____ # of packs		
32. DATE OF LAST NORMAL MENSTRUATION BEGAN <u>07</u> / <u>21</u> / <u>2003</u> MM DD YYYY		33. PLURALITY - Single, Twin, Triplet, etc. (Specify) <u>Single</u>		34. IF NOT SINGLE BIRTH - Born First, Second, Third, etc. (Specify) _____		
35. MOTHER TRANSFERRED FOR MATERNAL MEDICAL OR FETAL INDICATIONS FOR DELIVERY? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						
Medical and Health Information	36. RISK FACTORS IN THIS PREGNANCY (Check all that apply):				37. INFECTIONS PRESENT AND/OR TREATED DURING THIS PREGNANCY (Check all that apply)	
	<input type="checkbox"/> Diabetes <input type="checkbox"/> Prepregnancy (Diagnosis prior to this pregnancy) <input type="checkbox"/> Gestational (Diagnosis in this pregnancy) <input type="checkbox"/> Hypertension <input type="checkbox"/> Prepregnancy (Chronic) <input checked="" type="checkbox"/> Gestational (PIH, preeclampsia, eclampsia) <input type="checkbox"/> Previous preterm birth <input type="checkbox"/> Other previous poor pregnancy outcome (Includes perinatal death, small-for-gestational age/ intrauterine growth restricted birth) <input checked="" type="checkbox"/> Vaginal bleeding during this pregnancy prior to the onset of labor <input type="checkbox"/> Pregnancy resulted from infertility treatment <input type="checkbox"/> Mother had a previous cesarean delivery If yes, how many _____ <input type="checkbox"/> None of the above				<input type="checkbox"/> Gonorrhea <input type="checkbox"/> Syphilis <input type="checkbox"/> Herpes Simplex Virus (HSV) <input type="checkbox"/> Chlamydia <input type="checkbox"/> Listeria <input type="checkbox"/> Group B Streptococcus <input type="checkbox"/> Cytomegalovirus <input type="checkbox"/> Parvo virus <input type="checkbox"/> Toxoplasmosis <input type="checkbox"/> None of the above <input type="checkbox"/> Other (Specify) _____	
Mother's Name _____ Mother's Medical Record No. _____	38. METHOD OF DELIVERY		39. MATERNAL MORBIDITY (Check all that apply) (Complications associated with labor and delivery)		40. CONGENITAL ANOMALIES OF THE FETUS (Check all that apply)	
	A. Was delivery with forceps attempted but unsuccessful? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No B. Was delivery with vacuum extraction attempted but unsuccessful? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No C. Fetal presentation at delivery <input checked="" type="checkbox"/> Cephalic <input type="checkbox"/> Breech <input type="checkbox"/> Other D. Final route and method of delivery (Check one) <input checked="" type="checkbox"/> Vaginal/Spontaneous <input type="checkbox"/> Vaginal/Forceps <input type="checkbox"/> Vaginal/Vacuum <input type="checkbox"/> Cesarean If cesarean, was a trial of labor attempted? <input type="checkbox"/> Yes <input type="checkbox"/> No E. Hysterectomy/Hysterectomy <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		<input checked="" type="checkbox"/> Maternal transfusion <input type="checkbox"/> Third or fourth degree perineal laceration <input type="checkbox"/> Ruptured uterus <input type="checkbox"/> Unplanned hysterectomy <input type="checkbox"/> Admission to intensive care unit <input type="checkbox"/> Unplanned operating room procedure following delivery <input type="checkbox"/> None of the above		<input type="checkbox"/> Anencephaly <input type="checkbox"/> Meningocele/Spina bifida <input type="checkbox"/> Cyanotic congenital heart disease <input type="checkbox"/> Congenital diaphragmatic hernia <input type="checkbox"/> Omphalocele <input type="checkbox"/> Gastroschisis <input checked="" type="checkbox"/> Limb reduction defect (excluding congenital amputation and dwarfing syndromes) <input type="checkbox"/> Cleft Lip with or without Cleft Palate <input type="checkbox"/> Cleft Palate alone <input type="checkbox"/> Down Syndrome <input type="checkbox"/> Karyotype confirmed <input type="checkbox"/> Karyotype pending <input type="checkbox"/> Suspected chromosomal disorder <input type="checkbox"/> Karyotype confirmed <input type="checkbox"/> Karyotype pending <input type="checkbox"/> Hypospadias <input type="checkbox"/> None of the anomalies listed above	

Appendix E

Definitions of Live Birth and Fetal Death

The following definitions come from the 1992 model law¹ and are based upon World Health Organization definitions and are recommended for use in the United States.

Live birth

Live birth means the complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of pregnancy, which, after such expulsion or extraction, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached. Heartbeats are to be distinguished from transient cardiac contractions; respirations are to be distinguished from fleeting respiratory efforts or gasps.

Important—If an infant breathes or shows any other evidence of life after complete delivery, even though it may be only momentary, the birth must be registered as a live birth and a death certificate must also be filed.

Fetal death

Fetal death means death prior to the complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of pregnancy and which is not an induced termination of pregnancy. The death is indicated by the fact that after such expulsion or extraction, the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles. Heartbeats are to be distinguished from transient cardiac contractions; respirations are to be distinguished from fleeting respiratory efforts or gasps.

Important—The States differ with respect to the minimum period of gestation for which a fetal death report is required to be reported. If the medical examiner or coroner has any questions about the requirements used in his or her State, he or she should contact the State office of vital statistics.

1. National Center for Health Statistics. Model State vital statistics act and regulations: 1992 revision. Hyattsville, Maryland: Public Health Service. 1995.

Appendix F

Facility Worksheet for the Report of Fetal Death

DRAFT (2/6/02)

Patient's medical record # _____ Patient's name _____
--

FACILITY WORKSHEET FOR THE REPORT OF FETAL DEATH

Complete this worksheet for pregnancies resulting in fetal death. The Model State Vital Statistics Act and Regulations recommend the following definition of fetal death. "Fetal death" means death prior to the complete expulsion or extraction from its mother of a production of human conception, irrespective of the duration of the pregnancy and which is not an induced termination of pregnancy. The death is indicated by the fact that after such expulsion or extraction, the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles. Heart beats are to be distinguished from transient cardiac contractions; respirations are to be distinguished from fleeting respiratory efforts or gasps. For detailed definitions, instructions, information on sources, and common key words and abbreviations for many of the items included in the worksheet please see "The Guide to Completing Facility Worksheets for the Certificate of Live Birth."

1. Facility name:* _____
(If not institution, give street and number)
2. Facility I.D. (National Provider Identifier): _____
3. City, Town or Location of delivery: _____ Zip code: _____
4. County of delivery: _____
5. Place of delivery:
 - ☐ Hospital
 - ☐ Freestanding birthing center (Freestanding birthing center is defined as one which has no direct physical connection with an operative delivery center.)
 - ☐ Home delivery
 - Planned to deliver at home ☐ Yes ☐ No
 - ☐ Clinic/Doctor's Office
 - ☐ Other (specify, e.g., taxi cab, train, plane, etc.) _____

*Facilities may wish to have pre-set responses (hard-copy and/or electronic) to questions 1-5 for deaths which occur at their institutions.

Prenatal

Sources: Prenatal care records, patient's medical records, labor and delivery records

Information for the following items should come from the patient's prenatal care records and from other medical reports in the patient's chart. If the patient's prenatal care record is not in her hospital chart, please contact her prenatal care provider to obtain the record, or a copy of the prenatal care information. Preferred and acceptable sources are given before each section. Please do not provide information from sources other than those listed.

6(a). Date of first prenatal care visit (Prenatal care begins when a physician or other health professional first examines and/or counsels the pregnant woman as part of an ongoing program of care for the pregnancy):

 M M D D Y Y Y Y

☐ **No prenatal care** (The mother did not receive prenatal care at any time during the pregnancy. If this box is checked skip 6(b))

6(b). Date of last prenatal care visit (Enter the date of the last visit recorded in the mother's prenatal records):

 M M D D Y Y Y Y

7. Total number of prenatal care visits for this pregnancy (Count only those visits recorded in the record.

If none enter "0"): _____

8. Date last normal menses began:

 M M D D Y Y Y Y

9. Number of previous live births now living (For multiple deliveries, includes live born infants born before this fetus in the multiple set.):

_____ Number ☐ None

10. Number of previous live births now dead (For multiple deliveries, includes live born infants born before this fetus in the multiple set who subsequently died):

_____ Number ☐ None

11. Date of last live birth:

 M M Y Y Y Y

12. Total number of other pregnancy outcomes (Include fetal losses of any gestational age- spontaneous losses, induced losses, and/or ectopic pregnancies. If this was a multiple delivery, include all fetal losses delivered before this fetus in the pregnancy):

_____ Number ☐ None

13. Date of last other pregnancy outcome (Date when last pregnancy which did not result in a live birth ended):

 M M Y Y Y Y

14. Risk factors in this pregnancy (Check all that apply):

Diabetes - (Glucose intolerance requiring treatment)

- ☐ Prepregnancy - (Diagnosis prior to this pregnancy)
☐ Gestational - (Diagnosis in this pregnancy)

Hypertension - (Elevation of blood pressure above normal for age, gender, and physiological condition.)

- ☐ Prepregnancy - (Chronic) (Diagnosis prior to this pregnancy)
☐ Gestational - (PIH, preeclampsia, eclampsia) (Diagnosis during this pregnancy)

☐ Previous preterm births - (History of pregnancy(ies) terminating in a live birth of less than 37 completed weeks of gestation)

☐ Other previous poor pregnancy outcome - (Includes perinatal death, small for gestational age/intrauterine growth restricted birth) - (History of pregnancies continuing into the 20th week of gestation and resulting in any of the listed outcomes. Perinatal death includes fetal and neonatal deaths.)

☐ Vaginal bleeding during this pregnancy prior to the onset of labor - (Any vaginal bleeding occurring any time in the pregnancy prior to the onset of labor.)

☐ Pregnancy resulted from infertility treatment - (Any assisted reproduction treatment whether artificial insemination, drugs (e.g., Clomid, Pergonal) or technical procedures (e.g., in-vitro fertilization) used to initiate the pregnancy.)

- ☐ Patient had a previous cesarean delivery - (Previous operative delivery by extraction of the fetus, placenta and membranes through an incision in the maternal abdominal and uterine walls.)
If Yes, how many _____
- ☐ None of the above

15. Infections present and/or treated during this pregnancy - (Present at start of pregnancy or confirmed diagnosis during pregnancy with or without documentation of treatment.) (Check all that apply):

- ☐ Gonorrhea - (a diagnosis of or positive test for *Neisseria gonorrhoeae*)
- ☐ Syphilis - (also called lues - a diagnosis of or positive test for *Treponema pallidum*)
- ☐ Herpes Simplex Virus (HSV) - (a diagnosis of or positive test for the herpes simplex virus)
- ☐ Chlamydia - (a diagnosis of or positive test for *Chlamydia trachomatis*)
- ☐ Listeria (LM) - (a diagnosis of or positive test for *Listeria monocytogenes*)
- ☐ Group B Streptococcus (GBS) - (a diagnosis of or positive test for *Streptococcus agalactiae* or group B streptococcus)
- ☐ Cytomegalovirus (CMV) - (a diagnosis of or positive test for the cytomegalovirus)
- ☐ Parvovirus (B19) - (a diagnosis of or positive test for parvovirus B19)
- ☐ Toxoplasmosis (Toxo) - (a diagnosis of or positive test for *Toxoplasma gondii*)
- ☐ None of the above
- ☐ Other (specify) _____

Labor and Delivery

Sources: Labor and delivery records, patient's medical records

16. Date of delivery:
M M D D Y Y Y Y

17. Time of delivery: _____ 24 hour clock

18. Name and title of person completing report:

(May be, but need not be, the same as the attendant at delivery.)

Name: _____

Title: _____

19. Date report completed:
M M D D Y Y Y Y

20. Was the mother transferred to this facility for maternal medical or fetal indications for delivery?

(Transfers include hospital to hospital, birth facility to hospital, etc.)

- ☐ Yes ☐ No

If Yes, enter the name of the facility mother transferred from:

21. Attendant's name, title, and N.P.I. (National Provider Identifier) (The attendant at delivery is the individual physically present at the delivery who is responsible for the delivery. For example, if an intern or nurse-midwife delivers a fetus under the supervision of an obstetrician who is present in the delivery room, the obstetrician is to be reported as the attendant):

Attendant's name

N.P.I.

Attendant's title:

- ☐ M.D.
☐ D.O.
☐ CNM/CM - (Certified Nurse Midwife/Certified Midwife)
☐ Other Midwife - (Midwife other than CNM/CM)
☐ Other specify: _____

22. Mother's weight at delivery (pounds): _____

23. Method of delivery (The physical process by which the complete delivery was effected)
(Complete A, B, C, D, and E):

- A. Was delivery with forceps attempted but unsuccessful? - (Obstetric forceps was applied to the fetal head in an unsuccessful attempt at vaginal delivery.)
☐ Yes ☐ No
- B. Was delivery with vacuum extraction attempted but unsuccessful? - (Ventouse or vacuum cup was applied to the fetal head in an unsuccessful attempt at vaginal delivery.)
☐ Yes ☐ No
- C. Fetal presentation at delivery (Check one):
☐ Cephalic - (Presenting part of the fetus listed as vertex, occiput anterior (OA), occiput posterior (OP))
☐ Breech - (Presenting part of the fetus listed as breech, complete breech, frank breech, footling breech)
☐ Other - (Any other presentation not listed above)
- D. Final route and method of delivery (Check one):
☐ Vaginal/Spontaneous - (Delivery of the entire fetus through the vagina by the natural force of labor with or without manual assistance from the delivery attendant)
☐ Vaginal/Forceps - (Delivery of the fetal head through the vagina by application of obstetrical forceps to the fetal head.)
☐ Vaginal/Vacuum - (Delivery of the fetal head through the vagina by application of a vacuum cup or ventouse to the fetal head.)
☐ Cesarean - (Extraction of the fetus, placenta and membranes through an incision in the maternal abdominal and uterine walls)
- If cesarean, was a trial of labor attempted? - (Labor was allowed, augmented or induced with plans for a vaginal delivery.)
☐ Yes ☐ No
- E. Hysterotomy/Hysterectomy
☐ Yes ☐ No

24. Maternal morbidity (Serious complications experienced by the patient associated with labor and delivery)

(Check all that apply):

- ☐ Maternal transfusion - (Includes infusion of whole blood or packed red blood cells associated with labor and delivery.)
- ☐ Third or fourth degree perineal laceration - (3° laceration extends completely through the perineal skin, vaginal mucosa, perineal body and anal sphincter. 4° laceration is all of the above with extension through the rectal mucosa.)
- ☐ Ruptured uterus - (Tearing of the uterine wall.)
- ☐ Unplanned hysterectomy - (Surgical removal of the uterus that was not planned prior to the admission. Includes anticipated but not definitively planned hysterectomy.)
- ☐ Admission to intensive care unit - (Any admission of the mother to a facility/unit designated as providing intensive care.)
- ☐ Unplanned operating room procedure following delivery - (Any transfer of the patient back to a surgical area for an operative procedure that was not planned prior to the admission for delivery. Excludes postpartum tubal ligations.)
- ☐ None of the above

25. Weight of fetus: _____ (grams) (Do not convert lb/oz to grams)

If weight in grams is not available, weight of fetus: _____ (lb/oz)

26. Obstetric estimate of gestation at delivery (completed weeks): _____(The delivery attendant's final estimate of gestation based on all perinatal factors and assessments. Do not compute based on date of the last menstrual period and the date of delivery.)**27. Sex** (Male, Female, or Unknown): _____**28. Plurality** (Specify 1 (single), 2 (twin), 3 (triplet), 4 (quadruplet), 5 (quintuplet), 6 (sextuplet), 7 (septuplet), etc.)

(Include all live births and fetal losses resulting from this pregnancy.): _____

29. If not single delivery (Order delivered in the pregnancy, specify 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, etc.) (Include all live births and fetal losses resulting from this pregnancy): _____**30. If not single delivery, specify number of fetal deaths in this delivery:** _____**31. Congenital anomalies of the fetus** (Malformations of the fetus diagnosed prenatally or after delivery.)

(Check all that apply):

- ☐ Anencephaly - (Partial or complete absence of the brain and skull. Also called anencephalus, acrania, or absent brain. Also includes fetuses with craniorachischisis (anencephaly with a contiguous spine defect).)
- ☐ Meningomyelocele/Spina bifida - (Spina bifida is herniation of the meninges and/or spinal cord tissue through a bony defect of spine closure. Meningomyelocele is herniation of meninges and spinal cord tissue. Meningocele (herniation of meninges without spinal cord tissue) should also be included in this category. Both open and closed (covered with skin) lesions should be included. Do not include Spina bifida occulta (a midline bony spinal defect without protrusion of the spinal cord or meninges).)
- ☐ Cyanotic congenital heart disease - (Congenital heart defects which cause cyanosis. Includes but is not limited to: transposition of the great arteries (vessels), tetralogy of Fallot, pulmonary or pulmonic valvular atresia, tricuspid atresia, truncus arteriosus, total/partial anomalous pulmonary venous return with or without obstruction.)
- ☐ Congenital diaphragmatic hernia - (Defect in the formation of the diaphragm allowing herniation of abdominal organs into the thoracic cavity.)
- ☐ Omphalocele - (A defect in the anterior abdominal wall, accompanied by herniation of some abdominal organs through a widened umbilical ring into the umbilical stalk. The defect is covered by a membrane (different from gastroschisis, see below), although this sac may rupture. Also called exomphalos. Do not include umbilical hernia (completely covered by skin) in this category.)
- ☐ Gastroschisis - (An abnormality of the anterior abdominal wall, lateral to the umbilicus, resulting in herniation of the abdominal contents directly into the amniotic cavity. Differentiated from omphalocele by the location of the defect and absence of a protective membrane.)
- ☐ Limb reduction defect (excluding congenital amputation and dwarfing syndromes) - (Complete or partial absence of a portion of an extremity associated with failure to develop.)

- ☐ Cleft Lip with or without Cleft Palate - (Incomplete closure of the lip. May be unilateral, bilateral or median.)
- ☐ Cleft Palate alone - (Incomplete fusion of the palatal shelves. May be limited to the soft palate or may extend into the hard palate. Cleft palate in the presence of cleft lip should be included in the "Cleft Lip with or without Cleft Palate" category above.)
- ☐ Down Syndrome - (Trisomy 21)
 - ☐ Karyotype confirmed
 - ☐ Karyotype pending
- ☐ Suspected chromosomal disorder - (Includes any constellation of congenital malformations resulting from or compatible with known syndromes caused by detectable defects in chromosome structure.)
 - ☐ Karyotype confirmed
 - ☐ Karyotype pending
- ☐ Hypospadias - (Incomplete closure of the male urethra resulting in the urethral meatus opening on the ventral surface of the penis. Includes first degree - on the glans ventral to the tip, second degree - in the coronal sulcus, and third degree - on the penile shaft.)
- ☐ None of the anomalies listed above

32. Method of Disposition

- ☐ Burial
- ☐ Cremation
- ☐ Hospital Disposition
- ☐ Donation
- ☐ Removal from State
- ☐ Other (Specify) _____

Cause-of-Death Section

Causes/Conditions Contributing to Fetal Death

Previous questions collected details on anomalies, morbidities, and risk factors known to be present for this patient and the fetus. The purpose of the next section is to get a description of those conditions that, in your opinion, **contributed** to the fetal death. Please report any condition judged to be a cause of death even if it has been reported elsewhere on the worksheet.

33. Initiating Cause/Condition

Among the choices below, please select the **ONE** which most likely began the sequence of events resulting in the death of the fetus. If it is not clear to you where to report a condition, write it on the "(Specify)" line that seems most appropriate.

Maternal Conditions/Diseases

(Specify) _____

Complications of Placenta, Cord or Membranes

- ☐ Rupture of membranes prior to onset of labor
- ☐ Abruptio placenta
- ☐ Placental insufficiency
- ☐ Prolapsed cord
- ☐ Chorioamnionitis
- ☐ Other (Specify) _____

Other Obstetrical or Pregnancy Complications (Specify) _____

Fetal Anomaly (Specify) _____

Fetal Injury (Specify) _____

Fetal Infection (Specify) _____

Other Fetal Conditions/Disorders

(Specify) _____

☐ Unknown

34. Other Significant Causes or Conditions

Select or Specify All Other Conditions Contributing to Death in Item 34.

Maternal Conditions/Diseases (Specify) _____
Complications of Placenta, Cord or Membranes <input type="checkbox"/> Rupture of membranes prior to onset of labor <input type="checkbox"/> Abruptio placenta <input type="checkbox"/> Placental insufficiency <input type="checkbox"/> Prolapsed cord <input type="checkbox"/> Chorioamnionitis <input type="checkbox"/> Other (Specify) _____
Other Obstetrical or Pregnancy Complications (Specify) _____
Fetal Anomaly (Specify) _____
Fetal Injury (Specify) _____
Fetal Infection (Specify) _____
Other Fetal Conditions/Disorders (Specify) _____
<input type="checkbox"/> Unknown

35. Was an autopsy performed?☐ Yes ☐ No ☐ Planned**36. Was a histological placental examination performed?**☐ Yes ☐ No ☐ Planned**37. Were autopsy or histological placental examination results used in determining the cause of fetal death?**☐ Yes ☐ No**38. Estimated time of fetal death**

- ☐ Dead at time of first assessment, no labor ongoing
☐ Dead at time of first assessment, labor ongoing
☐ Died during labor, after first assessment
☐ Unknown time of fetal death

Appendix G

Patient's Worksheet for the Report of Fetal Death

<p style="text-align: center;">DRAFT (2/6/02)</p>	<p style="text-align: center; font-size: small;">Patient's Medical Record # _____ FOR HOSPITAL USE ONLY</p>
<p style="background-color: #cccccc; display: inline-block; padding: 2px 10px;">Patient's Name _____</p>	

Patient's Worksheet for the Report of Fetal Death

We are truly sorry about the loss you have experienced. We understand that this is a difficult time for you and your loved ones. We need to ask you a few questions to assist in the completion of the official report of fetal death. State laws provide protection against the unauthorized release of identifying information from the report of fetal death to ensure confidentiality of the parents. This information may also help researchers understand some of the factors that are related to miscarriage and stillbirth. Your assistance in providing complete and accurate information is very important. We appreciate your help, especially during this very difficult time.

PLEASE PRINT CLEARLY

1. Would you like to name the child? This is entirely optional.

 First Middle Last Suffix (Jr., III, etc.)

2. What is your current legal name?

 First Middle Last Suffix (Jr., III, etc.)

3. Where do you usually live—that is—where is your household/residence located?

Complete number and street: _____ Apartment Number: _____
 (Do not enter rural route numbers)
 City, Town, or Location: _____
 County: _____ State: _____
 Zip Code: _____ (or U.S. Territory, Canadian Province)
 If not United States, *country* _____

4. Is this household inside city limits (inside the incorporated limits of the city, town, or location where you live)?

☐ Yes
☐ No
☐ Don't know

	Patient's Name _____
--	----------------------

5. What is your mailing address?

☐ Same as residence [Go to next question]

Complete number and street: _____
 Apartment Number: _____ P. O. Box: _____
 City, Town, or Location: _____
 State: _____ Zip Code: _____
 (or U.S. Territory, Canadian Province)

If not in the United States, *country* _____

6. What is your date of birth? (Example: 3 - 4 - 1977)

 Month Day Year

7. In what State, U.S. territory, or foreign country were you born?
Please specify one of the following:

State _____
or
 U.S. territory, i.e., Puerto Rico, U.S. Virgin Islands, Guam, American Samoa or Northern Marianas

or
 Foreign country _____

8. What is the highest level of schooling that you have completed at the time of delivery? (Check the box that best describes your education. If you are currently enrolled, check the box that indicates the previous grade or highest degree received).

☐ 8th grade or less
☐ 9th - 12th grade, no diploma
☐ High school graduate or GED completed
☐ Some college credit, but no degree
☐ Associate degree (e.g. AA, AS)
☐ Bachelor's degree (e.g. BA, AB, BS)
☐ Master's degree (e.g. MA, MS, MEng, MEd, MSW, MBA)
☐ Doctorate (e.g. PhD, EdD) or Professional degree (e.g. MD, DDS, DVM, LLB, JD)

Patient's Name _____

9. Are you Spanish/Hispanic/Latina? If not Spanish/Hispanic/Latina, check the "No" box. If Spanish/Hispanic/Latina, check the appropriate box.

- ☐ No, not Spanish/Hispanic/Latina
☐ Yes, Mexican, Mexican American, Chicana
☐ Yes, Puerto Rican
☐ Yes, Cuban
☐ Yes, other Spanish/Hispanic/Latina (e.g. Spaniard, Salvadoran, Dominican, Colombian)(specify) _____

10. What is your race? (Please check one or more races to indicate what you consider yourself to be).

- ☐ White
☐ Black or African American
☐ American Indian or Alaska Native (name of enrolled or principal tribe) _____
☐ Asian Indian
☐ Chinese
☐ Filipino
☐ Japanese
☐ Korean
☐ Vietnamese
☐ Other Asian (specify) _____
☐ Native Hawaiian
☐ Guamanian or Chamorro
☐ Samoan
☐ Other Pacific Islander (specify) _____
☐ Other (specify) _____

11. Have you ever been married?

- ☐ Yes [Please go to question 12]
☐ No [Please go to question 14]

12. What name did you use prior to your first marriage?

 First Middle Last Suffix(Jr., III, etc.)

	Patient's Name
<p>13. Were you married at the time you conceived this child, at the time of delivery, or at any time between conception and delivery?</p> <p> <input type="checkbox"/> Yes <input type="checkbox"/> No </p>	
<p>14. What is the current legal name of your baby's father?</p> <p> _____ First Middle Last Suffix(Jr., III, etc.) </p>	
<p>15. What is the father's date of birth? (Example: 3 - 4 - 1976)</p> <p> _____ Month Day Year </p> <p><input type="checkbox"/> Don't know</p>	
<p>16. In what State, U.S. territory, or foreign country was the father born? Please specify one of the following:</p> <p>State _____</p> <p><i>or</i></p> <p>U.S. territory, i.e., Puerto Rico, U.S. Virgin Islands, Guam, American Samoa or Northern Marianas</p> <p>_____</p> <p><i>or</i></p> <p>Foreign country _____</p>	
<p>17. Did you receive WIC (Women, Infants & Children) food for yourself during this pregnancy?</p> <p> <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Don't know </p>	

Patient Name _____

18. What is your height?

_____ feet _____ inches

19. What was your prepregnancy weight, that is, your weight immediately before you became pregnant with this child?

_____ lbs

14. How many cigarettes OR packs of cigarettes did you smoke on an average day during each of the following time periods? If you NEVER smoked, enter zero for each time period.

	# of cigarettes		# of packs
Three months before pregnancy	_____	OR	_____
First three months of pregnancy	_____	OR	_____
Second three months of pregnancy	_____	OR	_____
Last three months of pregnancy	_____	OR	_____

Thank you for completing this worksheet at this very difficult time. The information you have provided is very important; it will be used by researchers to better understand factors related to miscarriage and stillbirth and lead to improved prevention strategies for the future.

Appendix H

The Vital Statistics Registration System in the United States

The registration of births, deaths, fetal deaths, and other vital events in the United States is a State and local function¹. The civil laws of every State provide for a continuous, permanent, and compulsory vital registration system. Each system depends to a very great extent upon the conscientious efforts of the physicians, hospital personnel, funeral directors, coroners, and medical examiners in preparing or certifying information needed to complete the original records. For a graphic presentation of the registration system, see the accompanying chart, "The Vital Statistics Registration System in the United States."

Most States are divided geographically into local registration districts or units to facilitate the collection of vital records. A district may be a township, village, town, city, county, or other geographic area or a combination of two or more of these areas. In some States, however, the law provides that records of birth, death, and/or fetal death be sent directly from the reporting source (hospital, physician, or funeral director) to the State vital statistics office. In this system, functions normally performed by a local registration official are assumed by the staff of the State office.

In States with a local registrar system, the local registrar collects the records of events occurring in his or her area and transmits them to the State vital statistics office. The local registrar is required to see that a complete certificate is filed for each event occurring in that district. In many States this official also has the duty of issuing burial-transit permits to authorize the disposition of dead human bodies. In many States this official is also required to keep a file of all events occurring within his or her district and, if authorized by State law and subject to the restrictions on issuance of copies as specified by the law, may be permitted to issue copies of these records.

The State vital statistics office inspects each record for promptness of filing, completeness, and accuracy of information; queries for missing or


¹Vital events are defined as live births, deaths, fetal deaths, marriages, divorces, and induced terminations of pregnancy, together with any change in civil status that may occur during an individual's lifetime.

inconsistent information; numbers the records; prepares indexes; processes the records; and stores the documents for permanent reference and safe-keeping. Statistical information from the records is tabulated for use by State and local health departments, other governmental agencies, and various private and voluntary organizations. The data are used to evaluate health problems and to plan programs and services for the public. An important function of the State office is to issue certified copies of the certificates to individuals in need of such records and to verify the facts of birth and death for agencies requiring legal evidence of such facts.

The Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) is vested with the authority for administering the vital statistics functions at the national level². Electronic data files derived from individual records registered in the State offices or, in a few cases, copies of the individual records themselves are transmitted to NCHS. From these data, monthly, annual, and special statistical reports are prepared for the United States as a whole and for the component parts—cities, counties, States, and regions—by various characteristics such as sex, race, and cause of death. These statistics are essential in the fields of social welfare, public health, and demography. They are also used for various administrative purposes, in both business and government. NCHS serves as a focal point, exercising leadership in establishing uniform practices through model laws, standard certificate forms, handbooks, and other instructional materials for the continued improvement of the vital statistics system in the United States.

²Hetzel AM. History and organization of the vital statistics system. Hyattsville, Maryland: National Center for Health Statistics. 1997.

The Vital Statistics Registration System in the United States

<i>Responsible Person or Agency</i>	<i>Birth Certificate</i>	<i>Death Certificate</i>	<i>Fetal Death Report</i>
Hospital authority	<ol style="list-style-type: none"> 1. Completes entire certificate using mother and facility worksheets. 2. Files certificate with local office or State office per State law. 	<p>When death occurs in hospital, may initiate preparation of certificate: Completes information on name, date, and place of death; obtains certification of cause of death from physician; and gives certificate to funeral director.</p> <p>NOTE: If the attending physician is unavailable to certify to the cause of death, some States allow a hospital physician to certify to only the fact and time of death. With legal pronouncement of the death and permission of the attending physician, the body can then be released to the funeral director. The attending physician still must complete the cause-of-death section prior to final disposition of the body.</p>	<ol style="list-style-type: none"> 1. Completes entire report using patient and facility worksheets. 2. Obtains cause of fetal death from physician. 3. Obtains authorization for final disposition of fetus. 4. Files report with local office or State office per State law.
Funeral director		<ol style="list-style-type: none"> 1. Obtains personal facts about decedent and completes certificate. 2. Obtains certification of cause of death from attending physician or medical examiner or coroner. 3. Obtains authorization for final disposition per State law. 4. Files certificate with local office or State office per State law. 	<p>If fetus is to be buried, the funeral director is responsible for obtaining authorization for final disposition.</p> <p>NOTE: In some States, the funeral director, or person acting as such, is responsible for all duties shown under hospital authority.</p>
Physician or other professional attendant	For inhospital birth, verifies accuracy of medical information and signs certificate. For out-of-hospital birth, duties are same as those for hospital authority, shown above.	Completes certification of cause of death and signs certificate.	Provides cause of fetal death and information not available from the medical records.

Local office* (may be local registrar or city or county health department)	<ol style="list-style-type: none"> 1. Verifies completeness and accuracy of certificate and queries incomplete or inconsistent certificates. 2. If authorized by State law, makes copy or index for local use. 3. Sends certificates to State registrar. 	<ol style="list-style-type: none"> 1. Verifies completeness and accuracy of certificate and queries incomplete or inconsistent certificates. 2. If authorized by State law, makes copy or index for local use. 3. If authorized by State law, issues authorization for final disposition on receipt of completed certificate. 4. Sends certificates to State registrar. 	If State law requires routing of fetal death reports through local office, performs the same functions as shown for the birth and death certificate.
City and county health departments	<ol style="list-style-type: none"> 1. Use data derived from these records in allocating medical and nursing services. 2. Follow up on infectious diseases. 3. Plan programs. 4. Measure effectiveness of services. 5. Conduct research studies. 		
State registrar, office of vital statistics	<ol style="list-style-type: none"> 1. Queries incomplete or inconsistent information. 2. Maintains files for permanent reference and is the source of certified copies. 3. Develops vital statistics for use in planning, evaluating, and administering State and local health activities and for research studies. 4. Compiles health-related statistics for State and civil divisions of State for use of the health department and other agencies and groups interested in the fields of medical science, public health, demography, and social welfare. 5. Sends data for all events filed to the National Center for Health Statistics. 		
Centers for Disease Control and Prevention, National Center for Health Statistics	<ol style="list-style-type: none"> 1. Evaluates quality of State vital statistics data and works with States to assure quality. 2. Compiles national statistical data file and runs edits to fully process data. 3. Prepares and publishes national statistics of births, deaths, and fetal deaths; constructs the official U.S. life tables and related actuarial tables. 4. Conducts health and social research studies based on vital records and on sampling surveys linked to records. 5. Conducts research and methodological studies in vital statistics methods, including the technical, administrative, and legal aspects of vital records registration and administration. 6. Maintains a continuing technical assistance program to improve the quality and usefulness of vital statistics. 7. Provides leadership and coordination in the development of standard certificates and report and model laws. 		

* Some States do not have local vital registration offices. In these States, the certificates or reports are transmitted directly to the State office of vital statistics.

July 2, 2020

Minnesota Board of Medical Practice

I am aware that under Minnesota law, the Board of Medical Practice has an obligation to make inquiries into complaints and reports of alleged violations of the Minnesota Medical Practice Act. I received your request for information, and pertinent documents and videos necessary for the board to address these allegations are attached.

I would like to begin by stating that as a physician who has practiced medicine in Minnesota for nearly forty years, and as an outspoken physician legislator in Minnesota, I believe the stated complaints and allegations in your letter are derived from politically motivated persons, but I respect your committee's responsibilities to conduct appropriate due diligence. Your correspondence referenced concerns regarding public statements, and I found it noteworthy that your concerns did not involve any actual patient care issues or complaints.

I want to make it very clear that because I was the chief senate author of the two major legislative health care policy bills over the last two years (Pharmacy Benefit Manager licensure and regulation; Insulin safety net program), and because I am vice-chair of the Senate Health and Human Services Committee, I certainly have been in the crosshairs of many politically energized people.

During the COVID-19 pandemic I have been both critical and complimentary of various actions by the Center for Disease Control (CDC), the Minnesota Department of Health, and the State of Minnesota. I take my role as one of the few physician-legislators in the State of Minnesota very seriously, and I firmly believe that I have an obligation to my patients, constituents, and all Minnesotans to use my medical expertise and senate experience to further an understanding of the pandemic situation by "connecting the dots" for citizens and patients who choose to consider a perspective other than what mainstream legacy news sources might choose to provide.

While serving as a legislator, I have been criticized and abused via social media, e-mail, voicemails and phone calls. Death threats have become for my wife and I an occasional "fact of life." Some of the same folks who exuberantly applauded my candid and nonpartisan communication efforts in February of 2020 regarding an insulin safety net program are the same people who now express disdain and ridicule for my "maverick" willingness to "go against the grain" regarding the current COVID-19 conventional media narratives. I have thought long and hard about what potential legal remedies might be available to me when I encounter blatant efforts to slander and harass me for expressing thoughts which don't match up with the "current" perspective.

For months now, people I have never met, never spoken to, and never treated medically have threatened to "report" me to various agencies and boards in an effort to stop me from applying what I believe to be appropriate medical and scientific scrutiny to the current events, treatments, and responses to COVID-19. I view the current allegations you are inquiring about as possible attempts by those who wish to discourage me from voicing alternative or contrarian points of view which may call into question certain governmental actions.

In the last few months, I have made hundreds of statements and comments on the floor of the Minnesota Senate, in various committee meetings, and in local and regional meetings. I have participated in local, national, and international television and radio shows to discuss the current COVID-19 circumstances. I

have said, “YES,” to virtually any request I could accommodate because I believe that is my job as an elected official. To my dismay I have been chastised for not knowing in advance if a hosting media event was conservative or liberal regarding biases – I never thought it should matter. It has become more than clear to me that the American political scene has truly become “blood sport.” Virtually all my public statements, comments, and opinions are available via YouTube, Facebook, Twitter, as well as various news and media outlets.

In responding to the two allegations outlined in your letter dated June 22, 2020, my intention is to respond in my own words and also provide attachments to help reveal the rationale informing my perspectives. I do believe these allegations evolved from an emotional and changing intersection of healthcare, public policy, and partisan politics such that information shared two months ago may no longer represent current perspectives. I have found in my last four years of serving in the Minnesota Senate that when people disagree with me politically, there is almost no telling what type of action or retaliation may occur.

Allegation #1. It is alleged that you were “spreading misinformation [regarding COVID-19] on a regional tv station [i.e. KXJB-TV], “claiming that the Minnesota Department of Health instructed providers to list COVID-19 as the cause of death on death certificates regardless of whether a patient died of COVID-19.

Response:

An allegation of “spreading misinformation” is nebulous and quite broad.

I did not claim that the Minnesota Department of Health (MDH) instructed providers to list COVID-19 as the cause of death regardless of whether a patient died of COVID-19.

But the fact of the matter is that on April 3, 2020 the Minnesota Department of Health emailed information to medical certifiers involved with cause of death certification responsibilities which did advise “physicians, physician assistants, and advanced practice registered nurses who certify deaths to ... report Coronavirus Disease 2019 or COVID-19 on death certificates for all decedents where the disease caused, is assumed to have caused, or contributed, to death.” (ATTACHMENT 1_MDH_4.3.20_initial email)

The language in this email contradicts CDC instructions which state that “significant conditions contributing to death” should not be assumed to be the CAUSE OF DEATH, but rather listed in Part II of the death certificate as a contributing condition. The CDC manual for completing death certificates specifically provides instructions that the UNDERLYING CAUSE OF DEATH (UCOD) should be “defined as the disease or injury that initiated the train of morbid events leading directly to death.” For example, a patient placed in hospice care with end-stage heart failure or cancer who is rapidly approaching death but in the last 24 hours of life is identified as having a positive COVID-19 test or exposure should have the UCOD determined to be the underlying problem which prompted the initiation of hospice care. Any other determination – such as COVID-19 per the advice in the April 3 email from MDH – contradicts CDC manuals, standard physician practices regarding the establishment of a causation sequence with the UCOD identified as the initiating event leading to the patient’s demise, and Minnesota’s own death certification instructions compiled by coroners and medical examiners. (ATTACHMENT 2_CDC Manual_pgs. 9-11; full manual available at: https://www.cdc.gov/nchs/data/misc/hb_cod.pdf)

Another example would be the following: an HIV patient develops AIDS, then contracts overwhelming Pneumocystis pneumonia, then decides to utilize supportive care hospice services. In the last days of his life he develops a taste disturbance and PCR test for COVID-19 is positive. The appropriate UNDERLYING CAUSE OF DEATH (UCOD) is NOT COVID-19 but rather HIV leading to AIDS leading to Pneumocystis pneumonia with COVID-19 possibly involved in the sequence of death as the immediate cause. If the physician believed that COVID-19 did not play a role as the immediate cause of death, she/he could place it in Part II as a contributing condition. It is critical to understand that the UCOD is placed on the bottom line of Part I of the death certificate and is considered the cause of death when tallying causes of death and prevalence of various diseases.

The triggering MDH email stated that COVID-19 should be reported for all decedents where COVID19 caused, is assumed to have caused, or contributed, to death. It also linked certifiers to a CDC seven-page document which on page 3 states that it is acceptable to report COVID-19 as the cause of death without laboratory confirmation if the circumstances are "within a reasonable degree of certainty." (ATTACHMENT 3_CDC_4.3.20_Guidance for Certifying Deaths Due to Coronavirus Disease 2019)

But unfortunately, the CDC reporting guidance went on to declare that in cases where a definite diagnosis of COVID-19 could not be made, but was suspected or likely, it was declared acceptable to report COVID-19 on a death certificate as "probable" or "presumed." This contradicted the following: (i) CDC's own instruction manual for physician completion of death certificates, (ii) standard medical procedures, (iii) WHO coding recommendations, and (iv) Minnesota death certification manual. (ATTACHMENT 4_MN Death Certificate Manual_pgs 48, 60-63; full manual available at: <https://www.health.state.mn.us/people/vitalrecords/physician-me/docs/capcodbook.pdf>)

Frankly the MDH email allowing or even encouraging the use of COVID-19 as a cause of death in the instance of being merely a contributing element was astounding to many physicians including myself – the initiating disease in the train of events leading to death has long been the basis for data and statistical compilation so as to inform public health policy, legislation, and even funding for disease control initiatives.

Both the MDH email and the CDC reporting guidance packet contributed to confusion. The CDC guidance packet was interpreted by many that if COVID-19 played a possible role in the death of a patient, this was enough to identify it as a cause of death. This led to remarkable situations in which no testing was done or even considered but death certificates still called out COVID-19 as the UCOD. The CDC guidance packet did indicate that, where possible, laboratory testing should be done through local health authorities. This "soft" recommendation opened the door for uncertainty and misunderstanding which unfortunately had subsequent impact throughout the world simply because a COVID-19 death was not held to the standard of being involved in the sequential train of causation leading to a patient's death.

I was disturbed by the guidance MDH and CDC promulgated and asserted publicly that the sequence-of-causation protocol traditionally used in determining the all-important UNDERLYING CAUSE OF DEATH (UCOD) was being undermined by the Minnesota Department of Health's invitation to establish COVID-19 as the UCOD regardless of whether or not a laboratory test confirmed the diagnosis of COVID-19 or regardless of the fact that such a test was even considered by a physician. I was alarmed that the nature of the April 3 MDH email seemed to "coach physicians" to complete death certificates in a manner outside standard practices and protocols. I believe that MDH potentially compromised the integrity of death certificate data by inviting the inclusion of "assumed" or "contributed" as a basis to code a death certificate as COVID-19 for the UCOD. I believe this represented a significant and noteworthy change

regarding the recommended practice for death certification which could easily reduce the number of deaths related to heart disease, cancer, stroke, emphysema, etc. in favor of exaggerating the COVID-19 death counts. With this less rigorous process for determining COVID-19 as the UCOD, even annual influenza patient counts would, at some level, be altered since the annual flu outbreak was still in process. (ATTACHMENT 5_AAFP_Editorial on Death Certificates)

I believe the origin of this allegation relates to an interview I participated in on April 7, 2020. I encourage you to watch the seven minute video (LINK BELOW) and would ask in advance that you be mindful of the difference linguistically between the words, "instructed" and "coached."

<https://www.powerlineblog.com/archives/2020/04/how-honest-is-the-covid-fatality-count.php>

As part of a response to any health crisis or pandemic, clear and verifiable information is key to addressing the situation, preparing a response, implementing preventative measures when possible, and providing treatment to the afflicted. All over Minnesota, the nation, and the world, there has been ongoing discussion related to how COVID-19 deaths are being reported. This is not misinformation; this is fact. (ATTACHMENTS 6,7,and 8_ Pennsylvania, Denver, New York)

In April of this year, the Illinois Director of Public Health, Dr. Ngozi Ezike stated the following:

"I just want to be clear in terms of the definition of people dying of COVID. The case definition is very simplistic. It means at the time of death it was a COVID positive diagnosis. So that means if you were in hospice and had already been given a few weeks to live, and then you also were found to have COVID, that would be counted as a COVID death. It means technically even if you died of a clear alternate cause, but you had COVID at the same time, it's still listed as a COVID death. So, everyone who's listed as a COVID death doesn't mean that that was the cause of the death, but they had COVID at the time of the death."

Dr. Deborah Birx, part of the White House medical team, made the famous statement which has become nearly memorialized:

"If someone dies with COVID-19, we are counting that as a COVID-19 death."

Her outlandish presumption that - no one died WITH COVID-19, rather they died FROM it - was "gas on the fire," and people around the world were quickly outraged. Any information, guidance, or publication which had the potential to skew, camouflage, or muddy the waters regarding an actual cause of death needed to be intensely scrutinized, in part because the recorded data in 2020 would shape future public policies which would have immense and lasting impact with potentially devastating unintended consequences.

In today's world of instant communication, any action taken by a governmental body or agency which does not provide clear, concise, and trustworthy information to the general public does nothing to further the public trust, and harms the reputation of such body or agency.

In summary the Minnesota Department of Health distributed instruction and guidance to providers to report COVID-19 on death certificates without precisely distinguishing between causation or correlation

or contribution to the UCOD. I have completed hundreds of death certificates over the last 40 years, and I vehemently disagree with this advice because it is absolutely contrary to past standard practice, created havoc and perverse incentives, and undermined quality data collection. New York, Pennsylvania, California, and many other states chose different paths to determine how to count COVID-19 deaths and each has undergone public scrutiny regarding such decisions.

The issue of laboratory confirmed cases not being segregated from presumed cases presents huge challenges which will require some level of uniformity in coding. (ATTACHMENT 9_COVID-19_ICD-10 Official Guidelines, specifically Chapter 1 (g)(1)(a), paragraph 3)

The notion that a contributing acute viral condition or test result could casually be inserted in place of a chronic progressive life-draining medical problem - such as cancer or heart failure - which was clearly the initiating condition sapping a patient's lifeblood to the point where death was closing in seemed ludicrous. I announced my concern publicly that the confounding communications by MDH and the CDC were problematic – but this assertion was not saying that MDH was “instructing providers to list COVID-19 as the cause of death regardless of whether a patient died of COVID-19.” Rather I expressed piercing alarms that public agencies were unilaterally moving in a dangerous direction that would potentially undermine the public trust just when policymakers needed that trust more than ever if citizens were to be expected to comply with earthshaking public policy decisions. The angst caused by such challenging considerations took root throughout the country, and Americans in every state have proven that they are worthy participants in this crucial conversation regarding the determination of death counts which will obviously impact on case fatality rates, comparisons with influenza epidemics, and state and federal funding decisions to help all Americans get through this crisis.

I hope every physician in Minnesota shares my concern that a paradigm shift in establishing the UCOD has taken place if the cause of death can now be established without regard for a precise sequence of causation or even ordering a simple lab test to bring science into the realm of determining the real cause of death. At the very least there should have been a conversation about this approach, but this did not occur. I reached out to dozens of physicians experienced in the completion of death certificates, and found no disagreement with my concerns. I suspect many physicians lacking ongoing experience with death certificate completion might see my concerns as more esoteric than real. I cannot fix that.

I protested what I perceived to be a counterproductive paradigm shift regarding death certificate completion, but I was gratified to see MDH and CDC distribute clarifying language to remedy the problem. MDH sent out two additional communications in the following weeks to clarify what had become very murky and also announced that it would count only laboratory test confirmed COVID-19 deaths in their tabulations and would sequester death certificates listing COVID-19 without laboratory confirmed tests until further research could be done (these fatalities are now identified with an asterisk on the MDH dashboard.) Numerous states reduced their official death counts in response to the national public outcry and debate regarding questionable cause of death determinations.

On April 9, I received an email from MDH containing clarifying guidance from the Office of Vital Records calling for accuracy, clarity, and confirmation of COVID-19 deaths. This April 9 guidance also reiterated that the UNDERLYING CAUSE OF DEATH meant “the disease or injury which initiated the train of morbid events leading directly to death.” It did not allow for a contributing condition to be the UCOD. (ATTACHMENT 10 and 11_MDH Final Guidance_4.9.20_AND_MDH Certifying Deaths Due to COVID-19_4.9.20)

On May 7, I received an additional MDH email with a link to video guidance for certifying COVID-19 deaths released by the National Center for Health Statistics (NCHS), and this video emphasized the need for the UCOD to represent best clinical judgement in identifying the most logical sequence of causation resulting in death. (ATTACHMENT 12_Video Guidance_5.7.20)

I did not claim that MDH instructed providers to list COVID-19 as the cause of death on death certificates regardless of whether a patient died of COVID-19. Rather I raised some questions:

- Should we be diagnosing COVID-19 in the absence of a laboratory confirmed test of COVID-19?
- If a laboratory confirmed test of COVID-19 is not obtained in a patient who dies, should death certificates be allowed to declare the UNDERLYING CAUSE OF DEATH as COVID-19? If so, in what circumstances?
- Does it matter if testing capability is readily available but not utilized in making the diagnosis of COVID-19? If the patient dies, does this change the diagnostic threshold?

Allegation #2. It is alleged that you also provided “reckless advice [regarding COVID-19] over social media,” stating that COVID-19 “is nothing more than the flu.”

Response:

Over the last few months, in my role as a citizen-physician-legislator, I have made numerous statements and comments in video clips, on the floor of the Minnesota Senate, in various committee meetings, and in local and regional meetings. I have made numerous appearances on local, national, and international television and radio shows. I cannot possibly respond with precision to an allegation that I have provided “reckless advice over social media,” as such an allegation is overly broad, and no specific instance of any such “reckless advice” is provided. Further, what someone who disagrees with a viewpoint I have expressed may deem “reckless advice,” another may deem quite sensible.

In regard to a statement that COVID-19 is “nothing more than a flu,” I have stated that the underlying COVID-19 virus has many similarities to other viruses: it is similar to the 2002 SARS Corona epidemic in regards to physiologic systems involved; it is similar to influenza viruses in that it is a single-stranded respiratory RNA virus with presenting symptoms of fever, cough, shortness of breath, malaise, headaches, muscle aches and GI disturbances. All three of these viruses – Covid-19, SARS, influenza - can kill thousands of people during an outbreak. I have provided specific contextual comparisons between influenza outbreaks and COVID-19 in regard to mortality, testing, latency and incubation periods, modelling uses and shortcomings, treatment protocols, and the unique ‘attack mode’ every virus has the potential to exhibit. Certainly, COVID-19 viruses are far more comparable to influenza viruses than to herpes viruses, Ebola viruses, or gastroenteritis viruses. .

The CDC reported the following on June 14, 2020:

“COVID-19 can look different in different people. For many people, being sick with COVID-19 would be a little bit like having the flu. People can get a fever, cough, or have a hard time taking deep breaths. Most people who have gotten COVID-19 have not gotten very sick. Only a small group of people who get it have had more serious problems.”

Dr. Anthony Fauci stated in a New England Journal of Medicine Editorial on March 26, 2020:

"This suggests that the overall clinical consequences of Covid-19 may ultimately be more akin to those of a severe seasonal influenza (which has a case fatality rate of approximately 0.1%) ..."

(ATTACHMENT 13_New England Journal of Medicine – COVID-19-Navigating the Uncharted).

Dr. Michael Osterholm told Beret Leone of Fox 47 Duluth News on March 14, 2020:

"Deadly strains of Influenza or the flu have been around for centuries. The flu has become a pandemic more than once and killed millions of people. It still exists today, but modern health experts are discussing what would happen if a new influenza virus showed up today, in world of 8-billion people. Unfortunately, we now have on our hands, but it's caused by a coronavirus which is acting very much like influenza."

(ATTACHMENT 14_National Infectious Disease Expert Talks COVID-19 in Duluth)

I have compared and opined on case fatality rates, incidence, and death totals between COVID-19 and influenza, which I believe to be eminently reasonable. I have called into question certain reporting metrics which fail to take into account the context of a given perspective, e.g. in 2018 influenza was reported to have caused ~80,000 deaths in the U.S. and the 1918 pandemic caused possibly 50 million deaths worldwide, albeit without the benefit of antibiotics. I have utilized numerous resources - MDH, DHS, CIDRAP, IHME – to inform my opinions. I have interviewed world experts on epidemiology and participated in BBC news programs, Tony Robbins podcasts (with an expert panel featuring world renowned authorities including a Nobel laureate).

I have commented on whether past treatments used for influenza syndromes (as well as other viruses/illnesses) could be beneficial in dealing with COVID-19. Most importantly I have shared with thousands of people through many platforms that a contextual understanding of the similarities and differences between COVID-19 and influenza is one of the most pertinent comprehensions Americans can strive for. I have tried to convey a message centering on scientifically established facts and teachings, personal responsibility, and hopefulness.

I do not recall ever saying specifically that COVID-19 "is nothing more than the flu." Please direct me to a specific source if you have information to the contrary. (Worldwide there are hundreds of media articles and videos which include comments I have made over the last four months, many without my awareness or permission.)

I do realize that some of my words have been taken out of context and used to fuel perspectives I do not share. In this world of social media, I do not know how to prevent this. I have erected increased safety and privacy guardrails on my social media pages. I have restricted others from posting and tagging on my pages. I have limited administrator access to my platforms. I have recruited numerous persons to scan media and promptly report any concerns to me.

As a Senator receiving thousands of inputs every week, I have diligently reached out to many detractors inviting conversation – some have accepted, most have not. Clearly politics and COVID-19 have become incredibly intertwined and dramatically divisive. For an outspoken and often skeptical physician legislator such as I am, the full exercising of freedom of speech has pushed me into a realm I previously have not explored. Rest assured, I am immensely frustrated by some of the antics that go on in social media, but I

have had to come to the unhappy conclusion that when the worlds of politics intersects with health care, selective use of news sources leads to amazing distortion, division, and discord.

These are critical times. These are hard times. More folks have died alone in long term care facilities than at any other time in my medical career. There will be a new normal emerging and it is still evolving. The resources physicians and patients depend on have become unnecessarily political. I am angry that my patients suffered, often unnecessarily. But I must say that your request for information has helped me process what has gone before us, and I am reinvigorated to do my part in helping Minnesota move through this dramatically difficult and bizarre time with grace and dignity and kindness to others.

Both of the allegations in question are false. Certainly, I might have been able to do some things differently to prevent the misuse of my words on social media sites of which I had never heard of. However, I know of no sure-fire way to do this, and daily I see message content from leaders in education, ministers, doctors, and politicians twisted and turned into something not in any way resembling original intent. Understanding this reality and ruminating on this lesson will be useful for me in the future.

I thank you for doing the work you do as I respectfully submit this response with attachments.

Senator Scott Jensen, M.D.

ATTACHMENT 1

OVR Operations and COVID-19 Death Certification Information

Minnesota Department of Health <mdh@public.govdelivery.com>

Fri, Apr 3, 2020 at 10:13 AM

Reply-To: mdh@public.govdelivery.com

To: smj2203@gmail.com

To our colleagues involved with death registration and certification:

Thank you for providing essential services during the COVID-19 pandemic. Especially now during this uncertain health situation, we appreciate your efforts to certify deaths and provide families the support they need. We want you to know that MDH and the Office of Vital Records (OVR) are here to support you and assure that death records are accurate and that timely registration and certification activities continue. Vital records are essential and we are following the Governor's orders and MDH's plan.

OVR is open and MR&C is available

- Minnesota Registration and Certification (MR&C) is a priority IT system—MR&C is available and is fully operational.
- MR&C and general support and service are available to you and all of our partners. Representatives are available from 8 a.m. to 4:30 p.m., Monday through Friday. Contact the OVR Help Desk at health.vitalrecords@state.mn.us or 651-201-5970. Please leave a voicemail message afterhours and OVR will call you back the next business day.
- OVR makes MR&C access a priority for medical certifiers who are ready to provide information about the cause and manner of death. Sign up to certify online by completing the Medical Certifier and Designated Staff User Agreement (PDF) found on the [MR&C for Medical Certifiers](#) webpage.
- Log in to MR&C from anywhere. MR&C is a web-based system that is available 24/7 from any internet connection.

Advice for physicians, physician assistants, and advanced practice registered nurses who certify deaths

- Take immediate action when you become aware that a patient has died and you need to provide a cause of death statement—timely certification of all deaths is critical during the pandemic. MR&C will send an email and the record will appear in your MR&C cause of death work queue.
 - Consider designating staff to enter your cause of death statements into MR&C on your behalf if you are out of the office, working remotely, or if operations in your clinic or facility are temporarily irregular.
 - Work out coverage with other medical certifiers who have access to your patients' medical records.
- Provide the date you last saw the decedent; **a telemedicine appointment is acceptable** as the date a decedent was last seen
- Provide cause of death information based on your best medical opinion using the information available to you. For guidance on how to enter cause of death information into MR&C, see the [MR&C for Medical Certifiers](#) webpage.
- Know that your cause of death statement is necessary for medical examiners and coroners to authorize cremation. Timely disposition is critical during the pandemic.
- Respond to medical examiners and coroners if they contact you about a death record.
- You can request that OVR correct information about the cause of death anytime, even after

issuance of certificates.

- **NEW!** Find the *Request to Change Cause or Manner of Death* (PDF) on the [OVR Forms for Medical Certifiers](#) webpage.
- Report **Coronavirus Disease 2019** or **COVID-19** on death certificates for all decedents where the disease caused, is assumed to have caused, or contributed, to death. Include as much detail as possible based on your knowledge of the patient, medical records, laboratory testing, etc. If the decedent had other chronic conditions such as COPD or asthma that may have also contributed, report the conditions in Part II.
- Find guidance for certifying COVID-19 deaths on the [Additional Resources for Medical Certifiers](#) webpage.

Please protect yourselves and stay healthy. Information about [Coronavirus Disease 2019 \(COVID-19\)](#) is on the Minnesota Department of Health website.

You can update or cancel your subscription at any time by [editing your personal profile](#). All you will need are your email address and your password (if you have selected one).

P.S. If you have any questions or problems please contact subscriberhelp.govdelivery.com for assistance.

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GOVDELIVERY

ATTACHMENT 2

Medical Certification of Death

The physician's primary responsibility in death registration is pronouncing the death and, when he or she is the attending physician, reporting cause of death. The medical part of the certificate includes:

- Date and time pronounced dead
- Date and time of death
- Question on whether the case was referred to the medical examiner or coroner
- Cause-of-death section including cause of death, manner of death, tobacco use, and females' pregnancy status items
- Injury items for cases involving injuries
- Certifier section with signatures

In most cases, a physician will both pronounce death and certify or report the cause of death. A different physician will pronounce death only when the attending physician is unavailable to certify the cause of death at the time of death and if State law provides for this option. If an inquiry is required by a State Post-Mortem Examinations Act, a medical examiner or coroner is responsible for determining cause of death (4).

Pronouncing date and time of death

Items 24 and 25 must be completed by the person who pronounces death. This may be the pronouncing physician, pronouncing/certifying physician, or the medical examiner or coroner. For cases involving a pronouncing physician different from the certifying physician, the pronouncing physician must also complete items 26–28.

Cause of death

This section must be completed by either the attending physician, the medical examiner, or the coroner. The cause-of-death section, a facsimile of which is shown below, follows guidelines recommended by the World Health Organization. An important feature is the reported underlying cause

of death determined by the certifying physician and defined as (a) the disease or injury that initiated the train of morbid events leading directly to death, or (b) the circumstances of the accident or violence that produced the fatal injury. In addition to the underlying cause of death, this section provides for reporting the entire sequence of events leading to death as well as other conditions significantly contributing to death (5).

The cause-of-death section is designed to elicit the opinion of the medical certifier. Causes of death on the death certificate represent a medical opinion that might vary among individual physicians. A properly completed cause-of-death section provides an etiologic explanation of the order, type, and association of events resulting in death. The initial condition that starts the etiologic sequence is specific if it does not leave any doubt as to why it developed. For example, sepsis is not specific because a number of different conditions may have resulted in sepsis, whereas human immunodeficiency virus syndrome is specific.

CAUSE OF DEATH (See instructions and examples)			Approximate interval: Onset to death
<p>32. PART I. Enter the <u>chain of events</u>—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p>			
IMMEDIATE CAUSE (Final disease or condition resulting in death)		a. _____ Due to (or as a consequence of):	_____
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST		b. _____ Due to (or as a consequence of):	_____
		c. _____ Due to (or as a consequence of):	_____
		d. _____	_____
PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.		33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No	
		34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No	
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined	

In certifying the cause of death, any disease, abnormality, injury, or poisoning, if believed to have adversely affected the decedent, should be reported. If the use of alcohol and/or other substance, a smoking history, a recent pregnancy, injury, or surgery was believed to have contributed to death, then this condition should be reported. The conditions present at the time of death may be completely unrelated, arising independently of each other; they may be causally related to each other, that is, one condition may lead to another which in turn leads to a third condition; and so forth. Death may also result from the combined effect of two or more conditions.

As can be seen, the cause-of-death section consists of two parts. The first part is for reporting the sequence of events leading to death, proceeding backwards from the final disease or condition resulting in death. So each condition in Part I should cause the condition above it. A specific cause of death should be reported in the last entry in Part I so there is no ambiguity about the etiology of this cause. Other significant conditions that contributed to the death, but did not lead to the underlying cause, are reported in Part II.

In addition, there are questions relating to autopsy, manner of death (for example, accident), and injury. The cause of death should include information provided by the pathologist if an autopsy or other type of postmortem examination is done. For deaths that have microscopic examinations pending at the time the certificate is filed, the additional information should be reported as soon as it is available. If the physician has any questions about the procedure for doing this, he or she should contact his or her State registrar.

For statistical and research purposes, it is important that the causes of death and, in particular, the underlying cause of death be reported as specifically and as precisely as possible. Careful reporting results in statistics for both underlying and multiple causes of death (i.e., all conditions mentioned on a death certificate) reflecting the best medical opinion.

Every cause-of-death statement is coded and tabulated in the statistical offices according to the latest revision of the *International Classification of Diseases* (5). When there is a problem with the reported cause of death (e.g., when a causal sequence is reported in reverse order), the rules provide a consistent way to select the most likely underlying cause. However, it is better when rules designed to compensate for poor reporting are not invoked so that the rules are confirming the physician's statement rather than imposing assumptions about what the physician meant.

Statistically, mortality research focuses on the underlying cause of death because public health interventions seek to break the sequence of causally related medical conditions as early as possible. However, all cause information reported on death certificates is important and is analyzed.

In the sections that follow, detailed instructions on how to complete Parts I and II are given. A number of examples of properly completed certificates with case histories are provided in this section to illustrate how the cause of death should be reported. Some common problems are also discussed later in this section.

ATTACHMENT 3

Vital Statistics Reporting Guidance



Report No. 3 • April 2020

Guidance for Certifying Deaths Due to Coronavirus Disease 2019 (COVID-19)

Introduction

In December 2019, an outbreak of a respiratory disease associated with a novel coronavirus was reported in the city of Wuhan in the Hubei province of the People's Republic of China (1). The virus has spread worldwide and on March 11, 2020, the World Health Organization declared Coronavirus Disease 2019 (COVID-19) a pandemic (2). The first case of COVID-19 in the United States was reported in January 2020 (3) and the first death in February 2020 (4), both in Washington State. Since then, the number of reported cases in the United States has increased and is expected to continue to rise (5).

In public health emergencies, mortality surveillance provides crucial information about population-level disease progression, as well as guides the development of public health interventions and assessment of their impact. Monitoring and analysis of mortality data allow dissemination of critical information to the public and key stakeholders. One of the most important methods of mortality surveillance is through monitoring causes of death as reported on death certificates. Death certificates are registered for every death occurring in the United States, offering a complete picture of mortality nationwide. The death certificate provides essential information about the deceased and the cause(s) and circumstances of death. Appropriate completion of death certificates yields accurate and reliable data for use in epidemiologic analyses and public health reporting. A notable example of the utility of death certificates for public health surveillance is the ongoing monitoring of pneumonia and influenza deaths. Accurate and timely death certificate data are integral to detecting elevated levels of influenza activity in real time (<https://www.cdc.gov/flu/weekly/index.htm>).

Monitoring the emergence of COVID-19 in the United States and guiding public health response will also require accurate and timely death reporting. The purpose of this report is to provide guidance to death certifiers on proper cause-of-death certification for cases where confirmed or suspected COVID-19 infection resulted in death. As clinical guidance on COVID-19 evolves, this guidance may be updated, if necessary. When COVID-19 is determined to be a cause of death, it is important that it be reported on the death certificate to assess accurately the effects of this pandemic and appropriately direct public health response.

Cause-of-Death Reporting

When reporting cause of death on a death certificate, use any information available, such as medical history, medical records, laboratory tests, an autopsy report, or other sources of relevant information. Similar to many other diagnoses, a cause-of-death statement is an informed medical opinion that should be based on sound medical judgment drawn from clinical training and experience, as well as knowledge of current disease states and local trends (6).

Part I

This section on the death certificate is for reporting the sequence of conditions that led directly to death. The immediate cause of death, which is the disease or condition that directly preceded death and is not necessarily the underlying cause of death (UCOD), should be reported on line a. The conditions that led to the immediate cause of death should be reported in a logical sequence in terms of time and etiology below it.

The UCOD, which is “(a) the disease or injury which initiated the train of morbid events leading directly to death or (b) the circumstances of the accident or violence which produced the fatal injury” (7), should be reported on the lowest line used in Part I.

Approximate interval: Onset to death

For each condition reported in Part I, the time interval between the presumed onset of the condition, not the diagnosis, and death should be reported. It is acceptable to approximate the intervals or use general terms, such as hours, days, weeks, or years.

Part II

Other significant conditions that contributed to the death, but are not a part of the sequence in Part I, should be reported in Part II. Not all conditions present at the time of death have to be reported—only those conditions that actually contributed to death.

Vital Statistics Reporting Guidance

Certifying deaths due to COVID-19

If COVID-19 played a role in the death, this condition should be specified on the death certificate. In many cases, it is likely that it will be the UCOD, as it can lead to various life-threatening conditions, such as pneumonia and acute respiratory distress syndrome (ARDS). In these cases, COVID-19 should be reported on the lowest line used in Part I with the other conditions to which it gave rise listed on the lines above it.

Generally, it is best to avoid abbreviations and acronyms, but COVID-19 is unambiguous, so it is acceptable to report on the death certificate.

In some cases, survival from COVID-19 can be complicated by pre-existing chronic conditions, especially those that result in diminished lung capacity, such as chronic obstructive pulmonary disease (COPD) or asthma. These medical conditions do not cause COVID-19, but can increase the risk of contracting a respiratory infection and death, so these conditions should be reported in Part II and not in Part I.

When determining whether COVID-19 played a role in the cause of death, follow the CDC clinical criteria for evaluating a person under investigation for COVID-19 and, where possible, conduct appropriate laboratory testing using guidance provided by CDC or local health authorities. More information on CDC recommendations for reporting, testing, and specimen collection, including postmortem testing, is available from: <https://www.cdc.gov/coronavirus/2019-nCoV/hcp/clinical-criteria.html> and <https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-postmortem-specimens.html>. It is important to remember that death certificate reporting may not meet mandatory reporting requirements for reportable diseases; contact the local health department regarding regulations specific to the jurisdiction.

In cases where a definite diagnosis of COVID-19 cannot be made, but it is suspected or likely (e.g., the circumstances are compelling within a reasonable degree of certainty), it is acceptable to report COVID-19 on a death certificate as “probable” or “presumed.” In these instances, certifiers should use their best clinical judgement in determining if a COVID-19 infection was likely. However, please note that testing for COVID-19 should be conducted whenever possible.

Common problems

Common problems in cause-of-death certification include:

1. reporting intermediate causes as the UCOD (i.e., on the lowest line used in Part I),
2. lack of specificity, and
3. illogical sequences.

Intermediate causes are those conditions that typically have multiple possible underlying etiologies and thus, a UCOD must

be specified on a line below in Part I. For example, pneumonia is an intermediate cause of death since it can be caused by a variety of infectious agents or by inhaling a liquid or chemical. Pneumonia is important to report in a cause-of-death statement but, generally, it is not the UCOD. The cause of pneumonia, such as COVID-19, needs to be stated on the lowest line used in Part I.

Additionally, the reported UCOD should be specific enough to be useful for public health and research purposes. For example, a “viral infection” can be a UCOD, but it is not specific. A more specific UCOD in this instance could be “COVID-19.”

All causal sequences reported in Part I should be logical in terms of time and pathology. For example, reporting “COVID-19” due to “chronic obstructive pulmonary disease” in Part I would be an illogical sequence as COPD cannot cause an infection, although it may increase susceptibility to or exacerbate an infection. In this instance, COVID-19 would be reported in Part I as the UCOD and the COPD in Part II. While there can be reasonable differences in medical opinion concerning a sequence that led to a particular death, the causes should always be provided in a logical sequence from the immediate cause on line a. back to the UCOD on the lowest line used in Part I.

Manner of death

The manner of death, sometimes referred to as circumstances of death, is also reported on death certificates. Natural deaths are due solely or almost entirely to disease or the aging process (8). In the case of death due to a COVID-19 infection, the manner of death will almost always be natural.

When to Refer to a Medical Examiner or Coroner

Some jurisdictions have requirements for referring deaths involving threats to public health to the medical examiner or coroner, so certifiers should follow the regulations in the jurisdiction in which the death occurred. As always, if a death involved an injury, poisoning, or complications thereof, then the case should be referred. The local medical examiner or coroner should be consulted with questions on referral requirements.

Conclusion

An accurate count of the number of deaths due to COVID-19 infection, which depends in part on proper death certification, is critical to ongoing public health surveillance and response. When a death is due to COVID-19, it is likely the UCOD and thus, it should be reported on the lowest line used in Part I of the death certificate. Ideally, testing for COVID-19 should be

Vital Statistics Reporting Guidance

conducted, but it is acceptable to report COVID–19 on a death certificate without this confirmation if the circumstances are compelling within a reasonable degree of certainty.

For more guidance and training on cause-of-death reporting in general, see the Cause of Death mobile app available from: <https://www.cdc.gov/nchs/nvss/mobile-app.htm> and the Improving Cause of Death Reporting online training module available from: https://www.cdc.gov/nchs/nvss/improving_cause_of_death_reporting.htm (free Continuing Medical Education credits and Continuing Nursing Education credits available). For current information on the COVID–19 outbreak, see the CDC website at: <https://www.cdc.gov/coronavirus/2019-nCoV/index.html>.

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Appendix. Scenarios and Example Certifications for Deaths Due to COVID-19

Scenario I: A 77-year-old male with a history of hypertension and chronic obstructive pulmonary disease

A 77-year-old male with a 10-year history of hypertension and chronic obstructive pulmonary disease (COPD) presented to a local emergency department complaining of 4 days of fever, cough, and increasing shortness of breath. He reported recent exposure to a neighbor with flu-like symptoms. He stated that his wheezing was not improving with his usual bronchodilator therapy. Upon examination, he was febrile, hypoxic, and in

moderate respiratory distress. His chest x-ray demonstrated hyperinflation and his arterial blood gas was consistent with severe respiratory acidosis. Testing of respiratory specimens indicated COVID-19. He was admitted to the ICU and despite aggressive treatment, he developed worsening respiratory acidosis and sustained a cardiac arrest on day 3 of admission.

Comment: In this case, the acute respiratory acidosis was the immediate cause of death, so it was reported on line a. Acute respiratory acidosis was precipitated by the COVID-19 infection, which was reported below it on line b. in Part I. The COPD and hypertension were contributing causes but were not a part of the causal sequence in Part I, so those conditions were reported in Part II.

Scenario I

CAUSE OF DEATH (See instructions and examples) 32. PART I. Enter the <u>chain of events</u> —diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary. IMMEDIATE CAUSE (Final disease or condition resulting in death) → a. Acute respiratory acidosis Due to (or as a consequence of): b. COVID-19 Due to (or as a consequence of): c. _____ Due to (or as a consequence of): d. _____ Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST		Approximate interval: Onset to death 3 days 1 week _____ _____
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I Chronic obstructive pulmonary disease, hypertension		33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No 34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH <input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined

Vital Statistics Reporting Guidance

Scenario II: A 34-year-old female with no significant past medical history

A 34-year-old female with no significant past medical history presented to her primary care physician complaining of 6 days of fever, cough, and myalgias. She was found to be febrile, hypotensive, and hypoxic. She was admitted to the hospital and underwent a CT scan of the chest, which revealed diffuse ground-glass opacification indicative of viral pneumonia. Respiratory specimens were sent for testing and rRT-PCR confirmed COVID-19. Her condition deteriorated over the next

2 days and she developed acute respiratory distress syndrome (ARDS). She was transferred to the ICU and started on positive pressure ventilation. Despite aggressive resuscitation, the patient expired on hospital day 4.

Comment: In this case, the immediate cause of death was ARDS, so it was reported on line a. as a consequence of pneumonia, which was reported on line b. The underlying cause of death (UCOD) was COVID-19 so it was reported on line c., the lowest line used in Part I.

Scenario II

CAUSE OF DEATH (See instructions and examples)			Approximate interval: Onset to death
32. PART I. Enter the <u>chain of events</u> —diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.			
IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)	a. Acute respiratory distress syndrome	Due to (or as a consequence of):	2 days
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST	b. Pneumonia	Due to (or as a consequence of):	10 days
	c. COVID-19	Due to (or as a consequence of):	10 days
	d.		
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I			33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
			34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input checked="" type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH <input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined	

Vital Statistics Reporting Guidance

Scenario III: An 86-year-old female with an unconfirmed case of COVID-19

An 86-year-old female passed away at home. Her husband reported that she was nonambulatory after suffering an ischemic stroke 3 years ago. He stated that 5 days prior, she developed a high fever and severe cough after being exposed to an ill family member who subsequently was diagnosed with COVID-19. Despite his urging, she refused to go to the hospital, even when her breathing became more labored and temperature escalated. She was unresponsive that morning and her husband phoned emergency medical services (EMS). Upon EMS arrival, the

patient was pulseless and apneic. Her husband stated that he and his wife had advanced directives and that she was not to be resuscitated. After consulting with medical command, she was pronounced dead and the coroner was notified.

Comment: Although no testing was done, the coroner determined that the likely UCOD was COVID-19 given the patient's symptoms and exposure to an infected individual. Therefore, COVID-19 was reported on the lowest line used in Part I. Her ischemic stroke was considered a factor that contributed to her death but was not a part of the direct causal sequence in Part I, so it was reported in Part II.

Scenario III

CAUSE OF DEATH (See instructions and examples)			Approximate interval: Onset to death
32. PART I. Enter the <u>chain of events</u> --diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.			
IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)	a. Acute respiratory illness	Due to (or as a consequence of):	1 day
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST	b. Probable COVID-19	Due to (or as a consequence of):	5 days
	c.	Due to (or as a consequence of):	
	d.	Due to (or as a consequence of):	
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I			
Ischemic stroke			33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
			34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input checked="" type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH <input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined	

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ATTACHMENT 4

Cause of Death and the Death Certificate

Certifiers should be aware that a vital records registration or processing fee may be charged when an amendment is made, and that additional expense may be incurred by the funeral director or family.

Interval Between Onset of Conditions and Death

For each condition listed in Part I of the cause-of-death statement, a space exists to indicate the approximate time interval between the onset of the condition and death. For each condition, the interval should be indicated as accurately as possible based on the certifier's assessment of available information. It is acceptable to list the interval as unknown or approximate, if such is the case. General intervals are also acceptable, such as seconds, minutes, hours, days, weeks, months, and several years. A range such as seconds to minutes, or other statement such as "Known for six years," may also be used. Stating the interval should not be approached casually—the information may be used to assess pre-existing conditions in some medicolegal settings or when insurance claims are processed. Stating the interval also serves as a check that the immediate, intermediate, and underlying causes of death have been written in the proper order.

The stated interval should be based on consideration of the clinical history, symptomatology, natural disease course, and knowledge of the potential uses of such information, not solely on the interval since diagnosis.

Part I	A. Pneumocystis carinii pneumonia	Approximate interval between onset and death 3 weeks
	Due to, or as a consequence of: B. Acquired immunodeficiency syndrome	3 years
	Due to, or as a consequence of: C. Human immunodeficiency virus infection	5 years
	Due to, or as a consequence of: D.	
Part II	OTHER SIGNIFICANT CONDITIONS: Conditions contributing to death but not resulting in the underlying cause of death in Part I Intravenous drug abuse	

Cause of Death and the Death Certificate

The Sequential Part I Format

Part I of the cause-of-death statement is constructed to allow an indication of a sequence of events where one condition results from another. The most recent condition is placed on the top line (A), then other antecedent conditions (ie, going backward in time) are entered on subsequently lower lines (B, then C, then D), as needed.

Part I	Immediate cause: A. Most recent condition (resulting from B)	Approximate interval between onset and death
	Due to, or as a consequence of: B. An antecedent (older) condition (resulting from C)	
	Due to, or as a consequence of: C. An even older condition (resulting from D)	
	Due to, or as a consequence of: D. The first (oldest) condition causing the others above	
Part II	OTHER SIGNIFICANT CONDITIONS: Conditions contributing to death but not resulting in the underlying cause of death in Part I	

Variations in Part I of the cause-of-death section on the death certificates used in different states relate primarily to the number of lines available for use (there are usually three or four lines). It is not required nor is it always necessary to use all of the lines in Part I.

All conditions listed in Part I have a sequential cause-and-effect relationship when read from the bottom to the top. Variation in the number of lines used does not affect the concept of sequence. The lowest completed line in Part I contains the oldest condition, and the uppermost completed line in Part I contains the most recent condition (the condition occurring closest to the time of death).

Cause of Death and the Death Certificate

The Underlying Cause of Death

For deaths that result from disease (natural conditions), the National Center for Health Statistics defines the underlying cause of death as the disease (condition) that initiated the train of morbid events leading directly to death. The definition becomes clearer when put in the context of completing Part I of the cause-of-death statement.

If Part I is written as ...

Part I	Immediate cause:	Approximate interval between onset and death
	A. Acute myocardial infarct	Hours
	Due to, or as a consequence of:	
	B. Atherosclerotic coronary artery disease	Years
	Due to, or as a consequence of:	
	C.	
	Due to, or as a consequence of:	
	D.	
Part II	OTHER SIGNIFICANT CONDITIONS: Conditions contributing to death but not resulting in the underlying cause of death in Part I	

... atherosclerotic coronary artery disease is the underlying cause of death because it is the disease (condition) that initiated the train of morbid events. Note that the underlying cause of death is the lowermost completed line in Part I. The underlying cause of death explains why death and the condition on the line above it (acute myocardial infarction) occurred. The underlying cause of death should be stated as etiologically specifically as possible.

As this example shows, it is not required, nor is it always necessary, to use all of the lines in Part I.

The most important concepts presented have to do with properly indicating the underlying cause of death. In general, the underlying cause of death has the greatest medical, legal, and epidemiologic importance—an easily remembered fact because, as in many important documents, it is the bottom line.

Cause of Death and the Death Certificate

Immediate Cause of Death

For deaths due solely to disease, the National Center for Health Statistics defines the *immediate cause of death* as the final disease or complication directly causing the death. The existence of an antecedent, or underlying cause, is implicit in the definition. Again, it is helpful to consider this definition in the context of completing Part I of the cause-of-death statement.

If more than one line is used when completing Part I, the top line (line A) is referred to as the immediate cause of death, which is the disease (condition) or complication of the underlying cause of death that occurred closest to the time of death (last).

The example from the previous page illustrates this concept:

Part I	Immediate cause:	Approximate interval between onset and death
	A. Acute myocardial infarct	Hours
	Due to, or as a consequence of:	
	B. Atherosclerotic coronary artery disease	Years
	Due to, or as a consequence of:	
	C.	
	Due to, or as a consequence of:	
	D.	
Part II	OTHER SIGNIFICANT CONDITIONS: Conditions contributing to death but not resulting in the underlying cause of death in Part I	

Thus, acute myocardial infarction is the immediate cause of death because it is the final complication of atherosclerotic coronary artery disease—the underlying cause of death. The immediate cause of death should be stated as etiologically specifically as possible. For example, in a patient whose underlying cause of death is human immunodeficiency virus infection, pneumocystis pneumonia is preferable to pneumonia as an immediate cause of death if pneumocystis is known to be the etiologic agent for the pneumonia.

Underlying and immediate causes of death are linked in a cause-and-effect relationship when read from bottom to top.

Cause of Death and the Death Certificate

Intermediate (Intermediary) Causes of Death

For deaths due solely to disease, an *intermediate (intermediary) cause of death* is a disease, condition, or complication that occurs somewhere in time between the underlying and immediate causes of death. Again, it is helpful to consider this definition in the context of completing Part I of the cause-of-death statement. If more than two lines are used when completing lines A through D in Part I, each line falling between the top line (the immediate cause of death) and lowermost completed line (the underlying cause of death) contains an intermediate cause of death.

The following example illustrates this concept:

Part I	Immediate cause: A. Pulmonary infarct	Approximate interval between onset and death Hours
	Due to, or as a consequence of: B. Pulmonary thromboembolism	Hours
	Due to, or as a consequence of: C. Deep leg vein thrombosis	Days
	Due to, or as a consequence of: D. Essential thrombocytosis	Months
Part II	OTHER SIGNIFICANT CONDITIONS: Conditions contributing to death but not resulting in the underlying cause of death in Part I	

Thus, pulmonary infarct is the immediate cause of death, pulmonary thromboembolism and deep leg vein thrombosis are each an intermediate cause of death, and essential thrombocytosis is the underlying cause of death. Underlying, intermediate, and immediate causes of death are linked in a sequential cause-and-effect relationship when read from bottom to top.

An intermediate cause of death should be stated as etiologically specifically as possible, realizing that it is not always possible to be completely specific. As illustrated by the example above, thromboembolism is fairly specific and identifies the nature of the embolus (thrombotic) from other types (such as air embolism), and is preferable to the less-specific phrase “pulmonary embolus.”

ATTACHMENT 5

Editorials

Death Certificates: Let's Get It Right

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It would be difficult to overstate the importance of death certificates—especially in an era of increasing reliance on evidence-based medicine (EBM)—yet physicians receive inadequate training in this important area, and their performance on this task remains less than ideal.¹⁻³

For small and large populations, the definitive assessment of our success at prolonging life is the age-adjusted mortality rate, and the primary tool for measuring mortality rates is the death certificate. In addition, death certificates serve other essential functions (National Center for Health Statistics, Centers for Disease Control and Prevention [CDC] online at <http://www.cdc.gov/nchs>), including setting national, regional, statewide, and local priorities for funding, research, and interventions⁴; settling estates, closing bank accounts, selling stocks and bonds, and determining insurance and pension benefits; providing evidence in court cases; and providing outcome data for major research studies.

Accurate completion is essential to ensure the usefulness and reliability of the individual death certificate as well as the aggregate mortality statistics derived from it, yet data suggest that cause and manner of death are not reported in a consistent fashion. In one recent survey in which 198 experienced and trained medical examiners determined the manner of death for 23 scenarios, there was more than 90 percent agreement for only four scenarios, 13 scenarios had between 60 and 90 percent agreement, and the remaining six scenarios had less than 60 percent agreement.⁵

While the cause of death may be difficult to agree on sometimes, most problems with death certificates stem from failure to complete them correctly. Yet, these errors are avoidable. Myers and Farquhar showed that major errors on death certificates dropped from 32.9 to 15.7 percent ($P = .01$) after primary care physicians attended a 75-minute educational seminar.⁶ Lakkireddy and colleagues also showed that improved completion of death certificates correlated with specific training in that skill.⁷

Physicians without training in death certificates may not even understand the correct definitions of the following terms:

Manner of Death

The context or circumstances that surround the death; examples include accident, suicide, homicide, and natural causes. Typically, physicians can only certify natural deaths, while the coroner or medical examiner must make the final determination for suicides, homicides, and even accidents as common as drug overdoses or falls.

Immediate Cause of Death

The proximate, most recently developed, final diagnostic entity causing the death. Must be a specific etiology (e.g., *Escherichia coli* sepsis, acute renal failure, hypoxemia), not a general concept such as old age or terms like cardiac arrest or organ system failure that can have multiple etiologies.

Underlying Cause of Death

This is the fundamental, original, foundational diagnosis or condition from which the remainder of the etiologic sequence springs; it is the diagnosis of longest duration in the chain of events leading directly to death. Examples include human immunodeficiency virus infection (the underlying cause of acquired immunodeficiency syndrome), coronary artery atherosclerosis, and metastatic breast cancer. The description must be specific enough to make clear why the intermediate (if any) and immediate causes of death developed.

In almost all cases, a time-linked chain of causation can be established, such that the immediate cause of death was a consequence of a somewhat longer-duration diagnosis, which in turn was a consequence of an even longer-duration diagnosis, and so on through as many or few intermediate causes as necessary until reaching the true underlying cause of death. Other significant, but not directly linked, conditions must be listed separately.

Common errors in completion of death certificates include incorrect attribution of the immediate cause of death, listing causes in an incorrect or illogical order, multiple competing immediate causes of death, poor match between cause and manner of death, and failure to identify the true underlying cause or causes.^{3,8} Consider these examples:

- Manner: Natural. Cause: Ventricular fibrillation, due to acute myocardial infarction, due to coronary artery thrombosis, as a consequence of atherosclerotic coronary artery disease. [Satisfactory: Note plausible chain of causality.]
- Manner: Natural. Cause: Pneumonia, due to a hip fracture, due to chronic obstructive pulmonary disease, as a consequence of diabetes mellitus and hypertension. [Unsatisfactory: No causal chain; possibly competing immediate causes; etiology of pneumonia unspecified; hip fracture is usually accidental, not natural; hypertension (in this case) and other diagnoses not in the direct causal chain should be listed in Part II, Other Significant Conditions.]

- Manner: Natural. Cause: Staphylococcal sepsis, due to methicillin-resistant staphylococcal pneumonitis, due to chronic aspiration, secondary to swallowing dysfunction, as a consequence of Parkinson's disease. [Satisfactory: Note clear and plausible chain of causality.]
- Manner: Natural. Cause: Congestive heart failure, as a consequence of ileostomy. [Unsatisfactory: No chain of causality; no clear underlying cause of the ileostomy or the heart failure.]

State statutes govern physician certification of cause of death and provide penalties for failure to complete in a timely or acceptable fashion. States require, and families depend on, certificates that are legible and clearly reproducible by photocopy and microfilm. Only permanent black ink should be used, erasures and "white-out" are not acceptable, and abbreviations should not be used. The physician who knew the decedent the best, or the attending physician, is responsible for completing the death certificate. A "probable" diagnosis is acceptable, as is listing a metastatic carcinoma of unknown primary site as an underlying cause. However, there is no "uncertain" or "unknown" category for cause of death; such cases should be referred to the medical examiner.

Based on the available data, we call for all medical students and residents to be trained to fill out death certificates correctly; for in-training, licensing, and certification examinations to assess competence in this area; and for practicing physicians to review death certificates as a part of their ongoing commitment to continuing medical education and quality of care. Excellent resources include information at the CDC⁸⁹ and many state and local health department Web sites, online tutorials by the National Association of Medical Examiners (http://www.thename.org/CauseDeath/COD_main_page.htm), and the Texas Department of Health (<http://www.dshs.state.tx.us>), and references 1, 2, and 6 listed below.

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ATTACHMENT 6

Pennsylvania Slashes Virus Death Toll; Reopening Explained

The administration of Gov. Tom Wolf is cautioning that a declining case count is just one factor that officials will consider in deciding whether a region of the state is ready to begin emerging from the pandemic.

By [Associated Press](#), Wire Service Content April 23, 2020, at 8:46 p.m.

BY MICHAEL RUBINKAM, MARK SCOLFORO and MARC LEVY,
Associated Press

HARRISBURG, Pa. (AP) — The administration of Gov. Tom Wolf cautioned Thursday that a declining case count is just one factor that officials will consider in deciding whether a region of the state is ready to begin emerging from the pandemic.

Wolf's reopening plan divides counties into six geographic regions, where shutdown rules may be relaxed once fewer than one person in 2,000 has been infected over the past two weeks.

Wolf said he believes two regions — the northcentral and northwest, both of which have seen relatively few cases — will be ready for a limited reopening on May 8, with residents permitted to leave their homes at will, and some retail shops allowed to accept customers.

But the case count isn't the only metric, officials said Thursday. The availability of diagnostic testing, the capacity of the health care system and the ability to quickly identify and contain flareups through what's known as contact tracing will also play a role. The state health department will also use a new modeling tool by Carnegie Mellon University.

A manageable number of new virus infections each day will be "very important, it's something we can measure and put down on paper, but it's not the only measure that we're going to be looking at," said the state health secretary, Dr. Rachel Levine.

Even in areas where some semblance of normalcy returns, Levine said she still wants people to wear masks in public and to keep their distance from each other to help prevent a resurgence of the virus.

Wolf, in a separate briefing, predicted that Pennsylvania's hard-hit southeast region will be the last to emerge from pandemic restrictions.

The Wolf standard is more stringent than reopening guidelines issued by the White House, which only call for a downward trajectory of documented cases over a 14-day period. Wolf, a Democrat, is under pressure from GOP lawmakers to open up more quickly and more broadly.

Other coronavirus-related developments in Pennsylvania:

DEATH TOLL SLASHED

The Pennsylvania Department of Health slashed the state's COVID-19 death toll on Thursday by 201, saying probable deaths it had previously included in the count were eliminated after further investigation.

The overall death toll now stands at 1,421, down from 1,622 reported a day earlier.

The number of deaths confirmed by a positive virus test actually rose overnight by 69, to 1,394. But Levine said Thursday that 270 probable deaths that had been added to the death toll in recent days have been removed after further investigation.

"This verification process is very intensive and under normal circumstances it can take months to complete," she said. "We continue to refine the data that we are collecting to provide everyone this information in as near time as we possibly can. This is really difficult with thousands of reports each day."

State health officials had recently changed the way they count COVID-19 deaths — now including probable deaths along with confirmed deaths — which resulted in a doubling of the state's death toll in just four days. A probable death is one in which a coroner or medical examiner listed COVID-19 as the cause or contributing cause, but the deceased was not tested for the virus.

Officials have said they are trying to reconcile data provided by hospitals, health care systems, county and municipal health departments and long-term care living facilities with the department's own records. Some county coroners have accused the state Department of Health of botching the numbers.

Statewide, more than 1,369 additional people tested positive for the virus that causes COVID-19, bringing the statewide total to more than 37,000, the health department reported Thursday.

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ATTACHMENT 7

The Denver Post

As coronavirus deaths become political flashpoint, Colorado changes how COVID-19 fatalities are publicly reported

By [JESSICA SEAMAN](#) | jseaman@denverpost.com and [ALEX BURNES](#) | aburness@denverpost.com | The Denver Post

PUBLISHED: May 15, 2020 at 9:45 p.m. | UPDATED: May 16, 2020 at 12:01 p.m.

State representative seeks criminal investigation of Colorado's public health director over allegations of falsified death data

Colorado's health department changed the way it publicly reports coronavirus deaths Friday, introducing a second category of fatalities after its methods came under scrutiny — including by a state representative who's calling for the agency's chief to be investigated.

How COVID-19 deaths are counted has become politically divisive, with critics claiming the numbers are inflated and medical experts saying deaths may actually be undercounted. Still, the number of deaths is a crucial data point that informs public understanding of the pandemic's severity and health officials' response to the crisis.

The Colorado Department of Public Health and Environment is now clarifying that its death tally includes the total number of fatalities among people who had COVID-19, including those deaths in which the respiratory disease was not the cause of death listed on the death certificate.

By the agency's count, there were 1,150 people who had died with COVID-19 in their systems as of Thursday.

Unlike that total, which has been updated daily by the agency since the start of the outbreak, death certificate data only shows 878 deaths were

caused by the new coronavirus between Feb. 1 and May 9 — but that number is expected to increase as there is a several-week lag.

“It’s what we know today as the number of deaths due to COVID based on death certificates,” said Chief Medical Officer Dr. Eric France, adding, “Either way the numbers are too high and there’s more to be done. We should be focusing as much as ever on what we can do to control the spread.”

Rep. Mark Baisley this week alleged the Department of Public Health and Environment has falsified the number of people who have died from COVID-19. The allegation comes amid reports that the health department counted some deaths as having been caused by the new coronavirus despite rulings from physicians and coroners that say otherwise.

“For a state agency to come in and start reclassifying causes of death is unusual and kind of disturbs a whole lot of people,” said Baisley, R-Roxborough Park.

Baisley sent a letter dated Thursday to 18th Judicial District Attorney George Brauchler, requesting an investigation “with the intent of bringing criminal charges against” Jill Hunsaker Ryan, the executive director of the state health department. Baisley’s letter was spurred by what he called a “disturbing” discrepancy in reporting at an Arapahoe County nursing home.

On Friday, Baisley said Brauchler has assigned a senior deputy district attorney to the investigation into potentially altered death certificates.

In a statement released by his office, Brauchler declined to discuss the details of any possible investigation. However, if it is determined that death certificates were altered “it is possible that misdemeanor charges would be filed,” the statement said.

Officials with the Department of Public Health and Environment said Friday they are not altering death certificates, but noted it is difficult to track deaths during such a large public health crisis.

“When COVID-19 is reported as a cause of death on the death certificate, more than likely it will be determined to be the underlying cause of death and contribute to those underlying mortality statistics,” said Kirk Bol,

manager of the vital statistics program, during a news conference. “But again, if COVID-19 was not determined to be part of the cause of death it should not be reported on the death certificate.”

How deaths are counted

Public health and medical experts have said counting deaths caused by the outbreak is tricky given a lack of sufficient testing and lags in reporting death certificate data. The accuracy of tests for COVID-19 also has been thrown into question, especially concerning false negatives.

Officials with the Department of Public Health and Environment said they are required by the U.S. Centers for Disease Control and Prevention to track and report the number of deaths among people with COVID-19, including those in which the coronavirus is not listed as a cause of death on their death certificate.

This information, according to the state agency’s website, is important to public health officials as it tells them about the transmission of the new coronavirus and can identify who is at risk of dying from complications from the disease.

Tracking a broader set of data as it relates to COVID-19 and deaths also enables the health agency to compare the epidemic’s toll in Colorado to that in other states that are following the CDC’s directive, public health officials said.

“On one hand we’re identifying and classifying cause of death by COVID,” France said. “And the other hand, we’re doing the important public health work by identifying cases, who also have died while they had COVID, either from it, or from something else, which is important as we do apples to apples comparisons across the state.”

But there have been questions about the accuracy of how the health department is tracking deaths where the disease is not the direct or partial cause of death.

Montezuma County Coroner George Deavers said he had a case, first reported by 9News, in which a man died with COVID-19 but had a blood-

alcohol level of 550 mg, well above the lethal amount. As a result, Deavers ruled the death was from alcohol poisoning. But, he said, the Department of Public Health and Environment counted it among its broader number of 1,150 COVID-19 deaths.

"I feel the state was wrong," he said, adding, "If it's a COVID death, it needs to be reported as a COVID death. If it's not a COVID death, it doesn't need to be reported as a COVID death. I'm not trying to pad the deaths one way or another."

COVID-19 is considered the cause of death when a person dies from a complication from the disease, such as pneumonia or respiratory failure, and would not have died at that time or place without the coronavirus. This includes people with underlying illnesses, such as lung and heart diseases.

But making these decisions on the cause of death can be complex. In La Plata County, Coroner Jann Smith had a case involving a person who had a long history of heart issues and while at the hospital tested positive for COVID-19.

Once the patient went home under hospice care, he tested negative. So when the individual died, Smith determined the heart issues were the cause of death.

"If he would have come back positive again, I might have done something different," she said, adding, "I won't say it was an easy decision. That was my decision and I'm comfortable with it."

Still, the health department included the death in its tally of COVID-19 fatalities.

"They have their guidelines to go by, and I have my decisions," Smith said. "I respect them for theirs."

The case of Someren Glen

Baisley's call for an investigation into the state health director was inspired by an April 17 letter written by Tim Rogers, executive director of the Someren Glen retirement community. The letter, which went to residents and their families, said the Centennial facility was aware of four residents whose deaths were confirmed to be related to COVID-19.

Someran Glen's attending physician, Rogers wrote, determined other recent deaths, including at least one of a resident who tested positive for the virus, were not caused by the coronavirus.

However, he said, the Department of Public Health and Environment counted at least seven resident deaths from the coronavirus — three more than his staff had calculated — and was deciding whether to include a potential eighth death that a physician had ruled was not COVID-related.

“(W)e were informed of their intention to override some of our attendant physician’s rulings and reclassify some resident passings we have experienced in the past few weeks,” Rogers wrote, adding, “We have never seen a situation where the health department overrules a physician’s findings. However, these are unprecedented times and the health department official did not share their motivation for changing physician’s orders.”

Pam Sullivan, spokeswoman for Someran Glen, said the purpose of the letter was to be “transparent.”

“The intention of our letter was to inform residents, families and team members that there would be a change in the numbers we were reporting of residents who had passed directly related to the COVID-19 virus due to re-classifications made by the Colorado Department of Public Health and Environment,” she said in a statement. “We have no involvement in the classification or re-classification of a resident who passes at our communities.”

France, the state’s chief medical officer, said he didn’t have details of the Someran Glen deaths. Cause-of-death determinations on death certificates are medical opinions by the coroner or a medical examiner or physician “and there isn’t a process by which we review and change them at the Department of Public Health,” he said

But Baisley characterized what happened as “government imposition, overreach, in a very intimate way.”

“You don’t mess with people’s families like that,” Baisley said. “Boy, for a state to come in and say, ‘We’re going to change (a cause of death) to

COVID-19,' because of whatever their motivations are, why would you do that?"

ATTACHMENT 8

NEW YORK N.Y.C. Death Toll Soars Past 10,000 in Revised Virus Count

Death Toll Soars Past 10,000 in Revised Virus Count

The city has added more than 3,700 additional people who were presumed to have died of the coronavirus but had never tested positive.



By J. David Goodman and William K. Rashbaum

• Published April 14, 2020 Updated April 21, 2020b New York Times

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New York City, already a world epicenter of the [coronavirus](#) outbreak, sharply increased its death toll by more than 3,700 victims on Tuesday, after officials said they were now including people who had never tested positive for the virus but were presumed to have died of it.

The new figures, released by the city's Health Department, [drove up the number of people killed in New York City to more than 10,000](#), and appeared to increase the overall United States death count by 17 percent to more than 26,000.

Coronavirus Deaths in New York City

The numbers brought into clearer focus the staggering toll the virus has already taken on the largest city in the United States, where deserted streets are haunted by the near-constant howl of ambulance sirens. Far more people have died in [New York City](#), on a per-capita basis, than in Italy — the hardest-hit country in Europe.

And in a city reeling from the overt danger posed by the virus, top health officials said they had identified another grim reality: The outbreak is likely to have also led indirectly to a spike in [deaths](#) of New Yorkers who may never have been infected.

Three thousand more people died in New York City between March 11 and April 13 than would have been expected during the same time period in an ordinary year, Dr. Oxiris Barbot, the commissioner of the city Health Department, said in an interview. While these so-called excess deaths were not explicitly linked to the virus, they might not have happened had the outbreak not occurred, in part because it overwhelmed the normal health care system.

"This is yet another part of the impact of Covid," she said, adding that more study was needed. Similar analysis is commonly done after heat waves and was performed [in the wake of Hurricane Maria in Puerto Rico](#).

"What New Yorkers are interested in, and what the country is interested in, is that we have an accurate and complete count," Dr. Barbot added. "It's part of the healing process that we're going to have to go through."

The revised death toll renewed focus on shortcomings in testing that have hamstrung city and state officials [since the beginning of the outbreak](#). A limited number of tests have been available, and until now, only deaths where a person had tested positive were officially counted among those killed by the virus in New York.

They were not included in the counts given publicly by Mayor Bill de Blasio because no tests had confirmed that the victims had the disease, Covid-19.

Mr. de Blasio decided, after another round of briefings over the weekend, to release the presumptive cases, the people said. Most of the added deaths took place in hospitals,

according to the data. Others occurred in nursing homes or other long-term care facilities and in residences.

“In the heat of battle, our primary focus has been on saving lives,” said Freddi Goldstein, the mayor’s press secretary. “As soon as the issue was raised, the mayor immediately moved to release the data.”

In California and Washington — locations of early cases in the American outbreak — officials said they included deaths as connected to Covid-19 only when the disease was confirmed by testing. Louisiana and Chicago followed the same protocol.

The new numbers in New York cover the weeks between March 11 to April 13, beginning at a time when the virus had already been spreading throughout the city and its surrounding suburbs. Mr. de Blasio and Gov. Andrew M. Cuomo shut down large swaths of the city and state by the third week of March.

New York City has been reporting the probable cases to the federal National Center for Health Statistics for more than a week, health officials said. But Dr. Barbot said that the city would continue reporting only confirmed cases to the Centers for Disease Control and Prevention for its coronavirus tracker, because the agency requested those statistics. “We are more than happy to report on probables,” she said.

The C.D.C., in its guidance to local governments, has recommended that cases of “assumed” coronavirus infection be noted on death certificates since before New York City recorded its first death on March 14.

ATTACHMENT 9

ICD-10-CM Official Coding and Reporting Guidelines April 1, 2020 through September 30, 2020

1. Chapter 1: Certain Infectious and Parasitic Diseases (A00-B99)

g. Coronavirus Infections

1) COVID-19 Infections (Infections due to SARS-CoV-2)

a) Code only confirmed cases

Code only a confirmed diagnosis of the 2019 novel coronavirus disease (COVID-19) as documented by the provider, documentation of a positive COVID-19 test result, or a presumptive positive COVID-19 test result. For a confirmed diagnosis, assign code U07.1, COVID-19. This is an exception to the hospital inpatient guideline Section II, H. In this context, “confirmation” does not require documentation of the type of test performed; the provider’s documentation that the individual has COVID-19 is sufficient.

Presumptive positive COVID-19 test results should be coded as confirmed. A presumptive positive test result means an individual has tested positive for the virus at a local or state level, but it has not yet been confirmed by the Centers for Disease Control and Prevention (CDC). CDC confirmation of local and state tests for COVID-19 is no longer required.

If the provider documents “suspected,” “possible,” “probable,” or “inconclusive” COVID-19, do not assign code U07.1. Assign a code(s) explaining the reason for encounter (such as fever) or Z20.828, Contact with and (suspected) exposure to other viral communicable diseases.

b) Sequencing of codes

When COVID-19 meets the definition of principal diagnosis, code U07.1, COVID-19, should be sequenced first, followed by the appropriate codes for associated manifestations, except in the case of obstetrics patients as indicated in Section . I.C.15.s. for COVID-19 in pregnancy, childbirth, and the puerperium.

For a COVID-19 infection that progresses to sepsis, see Section I.C.1.d. Sepsis, Severe Sepsis, and Septic Shock

See Section I.C.15.s. for COVID-19 in pregnancy, childbirth, and the puerperium

c) Acute respiratory illness due to COVID-19

(i) Pneumonia

For a pneumonia case confirmed as due to the 2019 novel coronavirus (COVID-19), assign codes U07.1, COVID-19, and J12.89, Other viral pneumonia.

(ii) Acute bronchitis

For a patient with acute bronchitis confirmed as due to COVID-19, assign codes U07.1, and J20.8, Acute bronchitis due to other specified organisms.

Bronchitis not otherwise specified (NOS) due to COVID-19 should be coded using code U07.1 and J40, Bronchitis, not specified as acute or chronic.

(iii) Lower respiratory infection

If the COVID-19 is documented as being associated with a lower respiratory infection, not otherwise specified (NOS), or an acute respiratory infection, NOS, codes U07.1 and J22, Unspecified acute lower respiratory infection, should be assigned.

If the COVID-19 is documented as being associated with a respiratory infection, NOS, codes U07.1 and J98.8, Other specified respiratory disorders, should be assigned.

(iv) Acute respiratory distress syndrome

For acute respiratory distress syndrome (ARDS) due to COVID-19, assign codes U07.1, and J80, Acute respiratory distress syndrome.

d) Exposure to COVID-19

For cases where there is a concern about a possible exposure to COVID-19, but this is ruled out after evaluation, assign code Z03.818, Encounter for observation for suspected exposure to other biological agents ruled out.

For cases where there is an actual exposure to someone who is confirmed or suspected (not ruled out) to have COVID-19, and the exposed individual either tests negative or the test results are unknown, assign code Z20.828, Contact with and (suspected) exposure to other viral communicable diseases. If the exposed individual tests positive for the COVID-19 virus, see guideline a).

e) Screening for COVID-19

For asymptomatic individuals who are being screened for COVID-19 and have no known exposure to the virus, and the test results are either unknown or negative, assign code Z11.59, Encounter for screening for other viral diseases. For individuals who are being screened due to a possible or actual exposure to COVID-19, see guideline d).

If an asymptomatic individual is screened for COVID-19 and tests positive, see guideline g).

f) Signs and symptoms without definitive diagnosis of COVID-19

For patients presenting with any signs/symptoms associated with COVID-19 (such as fever, etc.) but a definitive diagnosis has not been established, assign the appropriate code(s) for each of the presenting signs and symptoms such as:

- R05 Cough
- R06.02 Shortness of breath
- R50.9 Fever, unspecified

If a patient with signs/symptoms associated with COVID-19 also has an actual or suspected contact with or exposure to someone who has COVID-19, assign Z20.828, Contact with and (suspected) exposure to other viral communicable diseases, as an additional code. This is an exception to guideline I.C.21.c.1, Contact/Exposure.

g) Asymptomatic individuals who test positive for COVID-19

For asymptomatic individuals who test positive for COVID-19, assign code U07.1, COVID-19. Although the individual is asymptomatic, the individual has tested positive and is considered to have the COVID-19 infection.

15. Chapter 15: Pregnancy, Childbirth, and the Puerperium (O00-O9A)

s) COVID-19 infection in pregnancy, childbirth, and the puerperium

During pregnancy, childbirth or the puerperium, a patient admitted (or presenting for a health care encounter) because of COVID-19 should receive a principal diagnosis code of O98.5-, Other viral diseases complicating pregnancy, childbirth and the puerperium, followed by code U07.1, COVID-19, and the appropriate codes for associated manifestation(s). Codes from Chapter 15 always take sequencing priority.

ATTACHMENT 10

Final Guidance for Certifying COVID-19 Deaths

Minnesota Department of Health <mdh@public.govdelivery.com>

Thu, Apr 9, 2020 at 3:39 PM

Reply-To: mdh@public.govdelivery.com

To: smj2203@gmail.com

Final Guidance for Certifying COVID-19 Deaths

On April 2, 2020, the National Center for Health Statistics (NCHS) released [Guidance for Certifying Deaths Due to Coronavirus Disease 2019 \(COVID-19\) \(PDF\)](#). This replaces guidance released earlier in March.

For your convenience, we created a two-page version of the NCHS guidance. [Certifying Deaths Due to COVID-19 \(PDF\)](#) is also available on the [Death Registration Information for Medical Certifiers](#) website.

Timely and accurate death registration is important. The MDH Office of Vital Records wants medical certifiers to be aware of the final guidance and ready to report COVID-19 confirmed deaths and COVID-19 related deaths accurately.

Visit the Minnesota [Coronavirus Disease 2019 \(COVID-19\)](#) webpages for situation updates and other information for health professionals, the public, schools, businesses and employers.

- [certcovidthsf.pdf](#)

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This email was sent to [smj2203@gmail.com](#) using GovDelivery Communications Cloud on behalf of: Minnesota Department of Health · [625 Robert Street North · St. Paul MN 55155](#) · 651-201-5000

GOVDELIVERY



certcovidthsf.pdf

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ATTACHMENT 11



Certifying Deaths Due to COVID-19

This information is from CDC's [Guidance for Certifying Deaths Due to Coronavirus Disease 2019 \(COVID-19\) \(PDF\)](#). See example certifications for deaths due to COVID-19 on pages 4-6 in the guidance above.

Cause of Death Part I – COVID-19

- If COVID-19 played a role in the death, **specify COVID-19 or Coronavirus Disease 2019.**
 - If a medical certifier reports “coronavirus” alone *without identifying a specific strain or without explicitly excluding COVID-19* the Office of Vital Records will contact the medical certifier.
- In many cases, COVID-19 will be the underlying cause of death (UCOD), as it can lead to pneumonia and acute respiratory distress syndrome (ARDS).
 - Report pneumonia or ARDS (and similar) on the lines *above* COVID-19.
 - Report COVID-19 on the lowest line used in Part I.
- If a diagnosis of COVID-19 is suspected or likely “...it is acceptable to report COVID-19 as ‘probable’ or ‘presumed’.”
- If test results for COVID-19 are pending, file the cause of death as “COVID-19, test results pending.” When the test results come back, whether positive or negative for COVID-19, complete the [Request to Change Cause or Manner of Death \(PDF\)](#) form to update the cause of death statement. The Office of Vital Records sends updated records to the National Center for Health Statistics (NCHS) to make national mortality statistics and Minnesota’s mortality data as accurate as possible.

Cause of Death, Part I – General information

A cause-of-death statement is an informed medical opinion based on sound medical judgment drawn from clinical training and experience, as well as knowledge of current disease states and local trends.

- Report the immediate cause of death on line “a.” The immediate cause of death:
 - Is not necessarily the UCOD.
 - Is not the mechanism of death (for example, cardiac or respiratory arrest).
- Report the sequence of conditions that led directly to death with the most recent condition on line “a.”
- Report the UCOD on the lowest line used in Cause of Death, Part I.
- UCOD means “the disease or injury which initiated the train of morbid events leading directly to death.”

Time interval: Onset to Death

For each condition reported in Part I, report the time interval between the presumed onset of the condition (not the diagnosis), and death.

CERTIFYING DEATHS DUE TO COVID-19

Cause of Death, Part II

In Part II, report other significant conditions that contributed to the death but are not a part of the sequence in Part I.

- Report only the conditions that actually contributed to death.
- COPD and asthma do not cause COVID-19 “but can increase the risk of contracting a respiratory infection and death.” Report these and similar conditions in Cause of Death, Part II.

Minnesota Department of Health
Office of Vital Records
85 East 7th Place
PO Box 64499
St. Paul, MN 55164-0499
651-201-5970
health.vitalrecords@state.mn.us
www.health.state.mn.us

04/06/2020

To obtain this information in a different format, call 651-201-5970.

ATTACHMENT 12

New Video Guidance for Certification of COVID-19 Deaths and Updated COVID-19 Coding Rules

Minnesota Department of Health <mdh@public.govdelivery.com>

Thu, May 7, 2020 at 7:31 AM

Reply-To: mdh@public.govdelivery.com

To: smj2203@gmail.com

Attention medical certifiers and designated staff:

The Office of Vital Records recently received the following information from the National Vital Statistics System at CDC about certifying COVID-19 deaths.

If you have questions about the material below, please contact health.dataquality@state.mn.us.

COVID-19 Alert No. 5

New Video Guidance for Certification of COVID-19 Deaths and Updated COVID-19 Coding Rules

May 5, 2020

New Video Guidance for Certification of COVID-19 Deaths

To supplement the published guidance on filling out death certificates for deaths related to COVID-19, the National Center for Health Statistics (NCHS) has released a short video on the NCHS YouTube channel. The video runs a little over 3 minutes and can be accessed directly at <https://www.youtube.com/watch?v=oL3VMwieAms>.

Updated COVID-19 Coding Rules

The National Center for Health Statistics (NCHS) is updating how it will be coding the term "COVID" without an indication of the specific strain reported on the death certificate. Previously, "COVID" was treated as a generic abbreviation for Coronavirus Disease and was coded B34.2 (Coronavirus infection, unspecified site). Since NCHS' original coding rules were issued, "COVID" has become an accepted shorthand for the more precise "COVID-

19.” In response, to this change NCHS is changing its coding rules and will now be coding “COVID” to U07.1 (COVID-19). NCHS will also be reviewing and recoding as necessary all 2020 deaths previously coded B34.2.

Other more general terms (e.g. “Coronavirus”) without an indication of the specific strain will continue to be coded to B34.2. NCHS will query the jurisdiction about B34.2 deaths. If the jurisdiction indicates that COVID-19 caused or contributed to the death the coding will be changed to U07.1

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ATTACHMENT 13

EDITORIAL



Covid-19 — Navigating the Uncharted

Anthony S. Fauci, M.D., H. Clifford Lane, M.D., and Robert R. Redfield, M.D.

The latest threat to global health is the ongoing outbreak of the respiratory disease that was recently given the name Coronavirus Disease 2019 (Covid-19). Covid-19 was recognized in December 2019.¹ It was rapidly shown to be caused by a novel coronavirus that is structurally related to the virus that causes severe acute respiratory syndrome (SARS). As in two preceding instances of emergence of coronavirus disease in the past 18 years² — SARS (2002 and 2003) and Middle East respiratory syndrome (MERS) (2012 to the present) — the Covid-19 outbreak has posed critical challenges for the public health, research, and medical communities.

In their *Journal* article, Li and colleagues³ provide a detailed clinical and epidemiologic description of the first 425 cases reported in the epicenter of the outbreak: the city of Wuhan in Hubei province, China. Although this information is critical in informing the appropriate response to this outbreak, as the authors point out, the study faces the limitation associated with reporting in real time the evolution of an emerging pathogen in its earliest stages. Nonetheless, a degree of clarity is emerging from this report. The median age of the patients was 59 years, with higher morbidity and mortality among the elderly and among those with coexisting conditions (similar to the situation with influenza); 56% of the patients were male. Of note, there were no cases in children younger than 15 years of age. Either children are less likely to become infected, which would have important epidemiologic implications, or their symptoms were so mild that their infection escaped detection, which has implications for the size of the denominator of total community infections.

On the basis of a case definition requiring a

diagnosis of pneumonia, the currently reported case fatality rate is approximately 2%.⁴ In another article in the *Journal*, Guan et al.⁵ report mortality of 1.4% among 1099 patients with laboratory-confirmed Covid-19; these patients had a wide spectrum of disease severity. If one assumes that the number of asymptomatic or minimally symptomatic cases is several times as high as the number of reported cases, the case fatality rate may be considerably less than 1%. This suggests that the overall clinical consequences of Covid-19 may ultimately be more akin to those of a severe seasonal influenza (which has a case fatality rate of approximately 0.1%) or a pandemic influenza (similar to those in 1957 and 1968) rather than a disease similar to SARS or MERS, which have had case fatality rates of 9 to 10% and 36%, respectively.²

The efficiency of transmission for any respiratory virus has important implications for containment and mitigation strategies. The current study indicates an estimated basic reproduction number (R_0) of 2.2, which means that, on average, each infected person spreads the infection to an additional two persons. As the authors note, until this number falls below 1.0, it is likely that the outbreak will continue to spread. Recent reports of high titers of virus in the oropharynx early in the course of disease arouse concern about increased infectivity during the period of minimal symptoms.^{6,7}

China, the United States, and several other countries have instituted temporary restrictions on travel with an eye toward slowing the spread of this new disease within China and throughout the rest of the world. The United States has seen a dramatic reduction in the number of travelers from China, especially from Hubei province.

At least on a temporary basis, such restrictions may have helped slow the spread of the virus: whereas 78,191 laboratory-confirmed cases had been identified in China as of February 26, 2020, a total of 2918 cases had been confirmed in 37 other countries or territories.⁴ As of February 26, 2020, there had been 14 cases detected in the United States involving travel to China or close contacts with travelers, 3 cases among U.S. citizens repatriated from China, and 42 cases among U.S. passengers repatriated from a cruise ship where the infection had spread.⁸ However, given the efficiency of transmission as indicated in the current report, we should be prepared for Covid-19 to gain a foothold throughout the world, including in the United States. Community spread in the United States could require a shift from containment to mitigation strategies such as social distancing in order to reduce transmission. Such strategies could include isolating ill persons (including voluntary isolation at home), school closures, and telecommuting where possible.⁹

A robust research effort is currently under way to develop a vaccine against Covid-19.¹⁰ We anticipate that the first candidates will enter phase 1 trials by early spring. Therapy currently consists of supportive care while a variety of investigational approaches are being explored.¹¹ Among these are the antiviral medication lopinavir–ritonavir, interferon- β , the RNA polymerase inhibitor remdesivir, chloroquine, and a variety of traditional Chinese medicine products.¹¹ Once available, intravenous hyperimmune globulin from recovered persons and monoclonal antibodies may be attractive candidates to study in early intervention. Critical to moving the field forward, even in the context of an outbreak, is ensuring that investigational products are evaluated in scientifically and ethically sound studies.¹²

Every outbreak provides an opportunity to gain important information, some of which is associated with a limited window of opportunity. For example, Li et al. report a mean interval of 9.1 to 12.5 days between the onset of illness and hospitalization. This finding of a delay in the progression to serious disease may be telling us something important about the pathogenesis of this new virus and may provide a unique window of opportunity for intervention. Achieving a better understanding of the pathogenesis of this disease will be invaluable in navigating our re-

sponses in this uncharted arena. Furthermore, genomic studies could delineate host factors that predispose persons to acquisition of infection and disease progression.

The Covid-19 outbreak is a stark reminder of the ongoing challenge of emerging and reemerging infectious pathogens and the need for constant surveillance, prompt diagnosis, and robust research to understand the basic biology of new organisms and our susceptibilities to them, as well as to develop effective countermeasures.

Disclosure forms provided by the authors are available with the full text of this editorial at NEJM.org.

From the National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, MD (A.S.F., H.C.L.); and the Centers for Disease Control and Prevention, Atlanta (R.R.R.).

This editorial was published on February 28, 2020, at NEJM.org.

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DOI: 10.1056/NEJMe2002387

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ATTACHMENT 14

National infectious disease expert talks COVID-19 in Duluth

March 14, 2020 7:36 pm Beret Leone News, Top Stories

DULUTH, MN (KBJR) -- Dr. Michael Osterholm made a stop in Duluth Friday to discuss the Coronavirus, COVID-19.

"In so many ways we are handling this today as if it was a Minneapolis Blizzard. What we have to do is change that mindset because this is going to be more of a coronavirus winter. An entire season and we're just in the first weeks of it."

Preparing for the long-run with the Coronavirus. That's what the University of Minnesota-Twin Cities infectious disease specialist said about the expected outcome of the pandemic.

Dr. Osterholm is at the forefront of the COVID-19 conversation. Friday he told us what impacts the virus could have long-term.

Deadly strains of Influenza or the flu have been around for centuries.

The flu has become a pandemic more than once and killed millions of people.

It still exists today, but modern health experts are discussing what would happen if a new influenza virus showed up today, in world of 8-billion people

"Unfortunately we now have on our hands, but it's caused by a coronavirus which is acting very much like influenza," said Dr. Osterholm.

The infectious disease expert said the outbreak is bound to have a worse outcome than a bad flu season, which is indicated already.

He said, "problem is this isn't just a couple weeks of illness. And already in this country, we're projecting that the number of deaths from this disease could easily surpass a bad flu season by 20-30 fold."

Osterholm authored 2017 book, Deadliest Enemy: Our War Against Killer Germs. In the book, he details the most pressing infectious disease threats of our day.

He said the Coronavirus is transmitted in two ways. "Through just kind of close contact with someone and breathing their air and those droplets that you cough out land on a surface."

Osterholm said people need to take precautions. "We should not be scaring people out of their wits, we should be scaring people into their wits [...] We have to figure out how are we going to exist? Are we going to close down everything for 6-months?"

The Doctor says as a society, social distancing is important during an outbreak, but communities have to find ways to use their limited resources to help those most vulnerable to the infection.

"It's one where we can't change it, but we can sure help people understand what they can do to get throughout and we can get through it"

Doctor Osterholm said he expects the virus to die down in the coming months but we could still see cases until the fall.

He adds, medical professionals hope to create a vaccine that would eliminate the virus but that's still a way out.

Beret Leone



PERSONAL AND CONFIDENTIAL

July 27, 2020

Scott M. Jensen, M.D.
9375 Pierson Lake Drive
Chaska, MN 55318

RE: Complaints regarding COVID-19 public statements
Board File Nos: BFA05200976, BFA05200977

Dear Dr. Jensen:

As you will recall from previous contact, the Board of Medical Practice has conducted an investigation of two complaints that were filed against you in relation to public statements you made regarding COVID-19.

After a thorough review of both the Medical Practice Act and the facts of the situation, including those that you have provided, the Board has decided to dismiss the complaints and close its investigation at this time.

Thank you for your cooperation in this matter. If you have any questions, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'Brian Anderson'.

Brian Anderson
Medical Regulations Analyst
612-548-2141
Brian.Anderson@state.mn.us

The infection fatality rate of COVID-19 inferred from seroprevalence data

John P.A. Ioannidis

Departments of Medicine, of Epidemiology and Population Health, of Biomedical Data Science,
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Funding: METRICS has been supported by a grant from the Laura and John Arnold Foundation

Disclosures: I am a co-author (not principal investigator) of one of the 23 seroprevalence studies.

ABSTRACT

Objective To estimate the infection fatality rate of coronavirus disease 2019 (COVID-19) from data of seroprevalence studies.

Methods Population studies with sample size of at least 500 and published as peer-reviewed papers or preprints as of July 11, 2020 were retrieved from PubMed, preprint servers, and communications with experts. Studies on blood donors were included, but studies on healthcare workers were excluded. The studies were assessed for design features and seroprevalence estimates. Infection fatality rate was estimated from each study dividing the number of COVID-19 deaths at a relevant time point by the number of estimated people infected in each relevant region. Correction was also attempted accounting for the types of antibodies assessed. Secondly, results from national studies were also examined from preliminary press releases and reports whenever a country had no other data presented in full papers or preprints.

Results 36 studies (43 estimates) were identified with usable data to enter into calculations and another 7 preliminary national estimates were also considered for a total of 50 estimates. Seroprevalence estimates ranged from 0.222% to 47%. Infection fatality rates ranged from 0.00% to 1.63% and corrected values ranged from 0.00% to 1.31%. Across 32 different locations, the median infection fatality rate was 0.27% (corrected 0.24%). Most studies were done in pandemic epicenters with high death tolls. Median corrected IFR was 0.10% in locations with COVID-19 population mortality rate less than the global average (<73 deaths per million as of July 12, 2020), 0.27% in locations with 73-500 COVID-19 deaths per million, and 0.90% in locations exceeding 500 COVID-19 deaths per million. Among people <70 years old, infection fatality rates ranged from 0.00% to 0.57% with median of 0.05% across the different locations (corrected median of 0.04%).

Conclusions The infection fatality rate of COVID-19 can vary substantially across different locations and this may reflect differences in population age structure and case-mix of infected and deceased patients as well as multiple other factors. Estimates of infection fatality rates inferred from seroprevalence studies tend to be much lower than original speculations made in the early days of the pandemic.

The infection fatality rate (IFR), the probability of dying for a person who is infected, is one of the most critical and most contested features of the coronavirus disease 2019 (COVID-19) pandemic. The expected total mortality burden of COVID-19 is directly related to the IFR. Moreover, justification for various non-pharmacological public health interventions depends crucially on the IFR. Some aggressive interventions that potentially induce also more pronounced collateral harms¹ may be considered appropriate, if IFR is high. Conversely, the same measures may fall short of acceptable risk-benefit thresholds, if the IFR is low.

Early data from China, adopted also by the World Health Organization (WHO),² focused on a crude case fatality rate (CFR) of 3.4%; CFR is the ratio of COVID-19 deaths divided by the number of documented cases, i.e. patients with symptoms who were tested and found to be PCR-positive for the virus. The WHO envoy who visited China also conveyed the message that there are hardly any asymptomatic infections.³ With a dearth of asymptomatic infections, the CFR approximates the IFR. Other mathematical models suggested that 40-70%,⁴ or even⁵ 81% of the global population would be infected. Influential mathematical models^{5,6} eventually dialed back to an IFR of 1.0% or 0.9%, and these numbers long continued to be widely cited and used in both public and scientific circles. The most influential of these models, constructed by Imperial College estimated 2.2 million deaths in the USA and over half a million deaths in the UK in the absence of lockdown measures.⁵ Such grave predictions justifiably led to lockdown measures adopted in many countries. With 0.9% assumed infection fatality rate and 81% assumed proportion of people infected, the prediction would correspond to a global number of deaths comparable with the 1918 influenza, in the range of 50 million fatalities.

Since late March 2020, many studies have tried to estimate the extend of spread of the virus in various locations by evaluating the seroprevalence, i.e. how many people in population samples have developed antibodies for the virus. These studies can be useful because they may

inform about the extend of under-ascertainment of documenting the infection based on PCR testing. Moreover, they can help obtain estimates about the IFR, since one can divide the number of observed deaths by the estimated number of people who are inferred to have been infected.

At the same time, seroprevalence studies may have several caveats in their design, conduct, and analysis that may affect their results and their interpretation. Here, data available as of July 11, 2020 were collected, scrutinized, and used to infer estimates of IFR in different locations where these studies have been conducted.

METHODS

Seroprevalence studies

The input data for the calculations of IFR presented here are studies of seroprevalence of COVID-19 that have been done in the general population, or in samples that might approximate the general population (e.g. with proper reweighting) and that have been published in peer-reviewed journals or have been submitted as preprints as of July 11, 2020. Only studies with at least 500 assessed samples were considered, since smaller datasets would entail extremely large uncertainty for any calculations to be based on them. When studies focused on making seroprevalence assessments at different time interval, they were eligible if at least one time interval assessment had a sample size of at least 500 participants; among different eligible time points, the one with the highest seroprevalence was selected, since seroprevalence may decrease over time as antibody titers wane. Studies with data collected over more than a month, and that could not be broken into at least one eligible time interval that did not exceed one month in duration were excluded, since it would not be possible to estimate a point seroprevalence with any reliability. Studies were eligible regardless of the exact age range of included participants, but studies including only children were excluded.

Studies where results were only released through press releases were not considered here, since it is very difficult to tell much about their design and analysis, and this is fundamental in making any inferences based on their results. Nevertheless, secondarily, results from national studies were also examined from preliminary press releases and reports whenever a country had no other data presented in full papers of preprints as of July 11, 2020. This allowed these countries to be represented in the collected data, but extra caution is required given the preliminary nature of this information. Preprints should also be seen with caution since they have not been yet fully peer-reviewed (although some of them have already been revised based on very extensive comments from the scientific community). However, in contrast to press releases, preprints typically offer at least a fairly complete paper with information about design and analysis.

Studies done of blood donors were eligible, although it is possible they may underestimate seroprevalence and overestimate IFR due to healthy volunteer effect. Studies done on health care workers were not eligible, since they deal with a group at potentially high exposure risk which may lead to seroprevalence estimates much higher than the general population and thus implausibly low IFR. For a similar reason, studies focused on communities (e.g. shelters or religious or other shared-living communities) were also excluded. Studies were eligible regardless of whether they aimed to evaluate seroprevalence in large or small regions, provided that the population of reference in the region was at least 5000 people.

Searches were made in PubMed (LitCOVID), medRxiv, bioRxiv, and Research Square using the terms “seroprevalence” and “antibodies” with continuous updates (last update July 11, 2020). Communication with colleagues who are field experts sought to ascertain if any major studies might have been missed.

Information was extracted from each study on location, recruitment and sampling strategy, dates of sample collection, sample size, types of antibody used (IgG, IgM, IgA), estimated crude

seroprevalence (positive samples divided by all samples test), and adjusted seroprevalence and features that were considered in the adjustment (sampling process, test performance, presence of symptoms, other).

Calculation of inferred IFR

Information on the population of the relevant location was collected from the papers. Whenever it was missing, it was derived based on recent census data trying to approximate as much as possible the relevant catchment area (e.g. region(s) or county(ies)), whenever the study did not pertain to an entire country. Some studies targeted specific age groups (e.g. excluding elderly people and/or excluding children) and some of them made inferences on number of people infected in the population based on specific age groups. For consistency, the entire population, as well as, separately, only the population with age <70 years were used for estimating the number of infected people. It was assumed that the seroprevalence would be similar in different age groups, but significant differences in seroprevalence according to age strata that had been noted by the original authors were also recorded to examine the validity of this assumption.

The number of infected people was calculated multiplying the relevant population with the adjusted estimate of seroprevalence. Whenever an adjusted seroprevalence estimate had not been obtained, the unadjusted seroprevalence was used instead. When seroprevalence estimates with different adjustments were available, the analysis with maximal adjustment was selected.

For the number of COVID-19 deaths, the number of deaths recorded at the time chosen by the authors of each study was selected, whenever the authors used such a death count up to a specific date to make inferences themselves. If the choice of date had not been done by the authors, the number of deaths accumulated until after 1 week of the mid-point of the study period was chosen. This accounts for the differential delay in developing antibodies versus dying from the infection. It should be acknowledged that this is an averaging approximation, because some

patients may die very soon (within <3 weeks) after infection (and thus are overcounted), and others may die very late (and thus are undercounted due to right censoring).

The inferred IFR was obtained by dividing the number of deaths by the number of infected people for the entire population, and separately for people <70 years old. The proportion of COVID-19 deaths that occurred in people <70 years old was retrieved from situational reports for the respective countries, regions, or counties in searches done in June 3-7 for studies published until June 7 and in July 3-11 for studies published later. A corrected IFR is also presented, trying to account for the fact that only one or two types of antibodies (among IgG, IgM, IgA) might have been used. Correcting seroprevalence upwards (and inferred IFR downwards) by 1.1-fold for not performing IgM measurements and similarly for not performing IgA measurements may be reasonable, based on some early evidence,⁷ although there is uncertainty about the exact correction factor.

Data synthesis considerations

Inspection of the IFR estimates across all locations showed vast heterogeneity with heterogeneity I^2 exceeding 99.9% and thus a meta-analysis would be inappropriate to report across all locations. Quantitative synthesis with meta-analysis across all locations would also be misleading since locations with high seroprevalence would tend to carry more weight than locations with low seroprevalence; locations with more studies (typically those that have attracted more attention because of high death tolls and thus high IFRs) would be represented multiple times in the calculations; and more sloppy studies with fewer adjustments would get more weight, because they would have spuriously tighter confidence intervals than more rigorous studies with more careful adjustments allowing for more uncertainty. Finally, with a highly skewed IFR distribution and with extreme between-study heterogeneity, synthesis with a typical random effects model would tend to produce an erroneously high summary IFR that approximates the

mean of the study-specific estimates (also heavily driven by hotbed high-mortality locations with more studies done), while for a skewed distribution the median is more appropriate.

Therefore, at a first step, IFR estimates from studies done in the same country (or in the US, the same state) were grouped together and a single IFR was obtained for that location, weighting the study-specific IFRs by the sample size of each study. This allowed to avoid giving inappropriately more weight to studies with higher seroprevalence estimates and those with seemingly tighter confidence intervals because of poor or no adjustments, while still giving more weight to larger studies. Then, a single summary estimate was used for each location and the median of the distribution of location-specific IFR estimates was calculated. Finally, it was explored whether the location-specific IFRs were associated with the COVID-19 mortality rate in the population (COVID-19 deaths per million people) in each location as of July 12, 2020; this allowed to assess whether IFR estimates tend to be higher in harder hit locations.

RESULTS

Seroprevalence studies

36 studies with a total of 43 eligible estimates were published either in the peer-reviewed literature or as preprints as of July 11, 2020.⁸⁻⁴³ Dates and processes of sampling and recruitment are summarized in Table 1, sample sizes, antibody types assessed and regional population appear in Table 2, estimated prevalence, and number of people infected in the study region are summarized in Table 3, and number of COVID-19 and inferred IFR estimates are found in Table 4. Several studies performed repeated seroprevalence surveys at different time points, and only the time point with the highest seroprevalence estimate is considered in the calculations. With three exceptions, this is also the latest time point. Furthermore, another 7 preliminary national estimates were also considered (Table 5)⁴⁴⁻⁵⁰ from countries that had no other seroprevalence study published as a full paper or preprint. This yielded a total of 50 eligible estimates.

At least seven studies found some statistically significant, modest differences in seroprevalence rates across some age groups (Oise: decreased seroprevalence in age 0-14, increased in age 15-17; Geneva: decreased seroprevalence in age >50; Netherlands: increased seroprevalence in age 18-30; New York state: decreased seroprevalence in age >55; Brooklyn: decreased seroprevalence in age 0-5, increased in age 16-20; Tokyo: increased seroprevalence in age 18-34, Spain: decreased seroprevalence in age 0-10, Belgium: higher seroprevalence in age >90). The patterns are not strong enough to suggest major differences in extrapolating across age groups, although higher values in adolescents and young adults and lower values in children cannot be excluded.

As shown in Table 1, these studies varied substantially in sampling and recruitment designs. The main issue is whether they can offer a representative picture of the population in the region where they are performed. A generic problem is that vulnerable people who are at high risk of infection and/or death may be more difficult to recruit in survey-type studies. COVID-19 infection seems to be particularly widespread and/or lethal in nursing homes, among homeless people, in prisons, and in disadvantaged minorities. Most of these populations are very difficult, or even impossible to reach and sample from and they are probably under-represented to various degrees (or even entirely missed) in surveys. This would result in an underestimation of seroprevalence and thus overestimation of IFR. Eleven of the 36 studies that are available as full papers (Iran,⁸ Geneva,¹⁰ Gangelt,¹⁶ Rio Grande do Sul,¹⁷ Luxembourg,²⁰ Los Angeles county,²² three Brazil studies,^{25,34,42} Spain,³⁶ and Louisiana³⁷) explicitly aimed for random sampling from the general population. In principle, this is a stronger design. However, even with such designs, people who cannot be reached (e.g. by e-mail or phone or even visiting them at a house location) will not be recruited, and these vulnerable populations are likely to be missed. Moreover, 5 of these 11 studies^{8,10,16,42,37} focused on studying geographical locations that had extreme numbers of

deaths, higher than other locations in the same city or country, and this would tend to select eventually for higher IFR on average.

Seven studies assessed blood donors in Denmark,¹² Netherlands,¹⁵ Scotland,¹⁸ the Bay Area in California,²⁴ Zurich/Lucerne,²⁸ Apulia³¹ and Rio De Janeiro.⁴¹ By definition these studies include people in good health and without symptoms, at least recently, and therefore may markedly underestimate COVID-19 seroprevalence in the general population. A small set of 200 blood donors in Oise, France¹³ showed 3% seroprevalence, while pupils, siblings, parents, teachings and staff at a high school with a cluster of cases in the same area had 25.9% seroprevalence; true population seroprevalence may be between these two values.

For the other studies, healthy volunteer bias may lead to underestimating seroprevalence and this is likely to have been the case in at least one case (the Santa Clara study)¹⁹ where wealthy healthy people were rapidly interested to be recruited when the recruiting Facebook ad was released. The design of the study anticipated correction with adjustment of the sampling weights by zip code, gender, and ethnicity, but it is likely that healthy volunteer bias may still have led to some underestimation of seroprevalence. Conversely, attracting individuals who might have been concerned of having been infected (e.g. because they had symptoms) may lead to overestimation of seroprevalence in surveys. Finally studies of employees, grocery store clients, or patient cohorts (e.g. hospitalized for other reasons, or coming to the emergency room, or studies using residual lab samples) may have sampling bias with unpredictable direction.

As shown in Table 2, all studies have tested for IgG antibodies, but only about half have also assessed IgM, 4 have assessed IgA. Only three studies assessed all three types of antibodies and one more used a pan-Ig antibody. Studies typically considered the results to be “positive” if any tested antibody type was positive, but one study (Luxembourg) that considered the results to be “positive” only if both IgG and IgA were detected. The ratio of people sampled versus the total

population of the region was better than 1:1000 in 11 studies (Idaho,⁹ Denmark blood donors,¹² Gangelt,¹⁶ Santa Clara,¹⁹ Luxembourg,²⁰ Brooklyn,²⁷ Zurich,²⁸ San Francisco,³³ Espirito Santo,³⁴ Spain,³⁶ and Vitacura⁴³).

Seroprevalence estimates

As shown in Table 3, prevalence ranged from as little as 0.222% to as high as 47%. Studies varied a lot on whether they tried or not to adjust their estimates for test performance, sampling (striving to get closer to a more representative sample), and clustering effects (e.g. when including same household members) as well as other factors. The adjusted seroprevalence occasionally differed substantially from the crude, unadjusted value. In principle adjusted values are likely to be closer to the true estimate, but the exercise shows that each study alone may have some unavoidable uncertainty and fluctuation, depending on the analytical choices preferred. In studies that sampled people from multiple locations, large between-location heterogeneity could be seen (e.g. 0-25% across 133 Brazilian cities).²⁵

Inferred IFR

Inferred IFR estimates varied a lot, from 0.00% to 1.63%. Corrected values also varied extensively, from 0.00% to 1.31%. For 10 locations, more than one IFR estimate was available and thus IFR from different studies evaluating the same location could be compared. As shown in figure 1, the IFR estimates tended to be more homogeneous within each location, while they differed a lot across locations. The sample size-weighted summary was used to generate a single estimate to represent each location. Data were available for 32 different locations. The median IFR across all 32 locations was 0.27% (0.24% using the corrected values). Most data came from locations with high death tolls and 23 of the 32 locations had a population mortality rate (deaths per million population) higher than the global average (73 deaths per million population as of July 12) (Figure 2). The uncorrected IFR estimates had a range of 0.01-0.16% (median 0.13%) across

the 9 locations with population mortality rate below the global average, 0.07-0.73% (median 0.27%) across the 15 locations with population mortality rate above the global average but below 500 deaths per million population, and 0.59-1.63% (median 1.12%) across the 8 extreme hotbed locations with over 500 deaths per million population. The corrected IFR estimates had medians of 0.10%, 0.25%, and 0.90%, respectively, for the three groups of locations.

The proportion of COVID-19 deaths that occurred in people <70 years old varied substantially across locations. All deaths in Gangelt were in elderly people while in Wuhan half the deaths occurred in people <70 years old and the proportion might have been higher in Iran, but no data could be retrieved for this country. When limited to people <70 years old, IFR ranged from 0.00% to 0.57% with median of 0.05% (corrected, 0.00-0.46% with median of 0.04%). IFR estimates in people <70 years old were lower than 0.1% in all but 7 locations that were hard-hit hotbeds (Belgium, Wuhan, Italy, Spain, Connecticut, Louisiana, New York).

DISCUSSION

IFR is not a fixed physical constant and it can vary substantially across locations, depending on the population structure, the case-mix of infected and deceased individuals and other, local factors. Inferred IFR values based on emerging seroprevalence studies typically show a much lower fatality than initially speculated in the earlier days of the pandemic.

The studies analyzed here represent 50 different estimates of IFR, but they are not fully representative of all countries and locations around the world. Most of them come from locations with overall COVID-19 mortality rates exceeding the global average (73 deaths per million people as of July 12). The median inferred IFR in locations with COVID-19 mortality rate below the global average is low (0.13%, corrected 0.10%). For hotbed countries with COVID-19 mortality rates above the global average but lower than 500 deaths per million, the median IFR is still not that high (median 0.27%, corrected 0.25%). Very high IFR estimates have been documented

practically in locations that had devastating experiences with COVID-19. Such epicenters are unusual across the globe, but they are overrepresented in the 50 seroprevalence estimates available for this analysis. Therefore, if one could sample equally from all countries and locations around the globe, the median IFR might be even lower than the one observed in the current analysis.

Several studies in hard-hit European countries inferred modestly high IFR estimates for the overall population, but the IFR was still low in people <70 years old. Some of these studies were on blood donors and may have underestimated seroprevalence and overestimated IFR. One study in Germany aimed to test the entire population of a city and thus selection bias is minimal: Gangelt¹⁶ represents a situation with a superspreader event (in a local carnival) and 7 deaths were recorded, all of them in very elderly individuals (average age 81, sd 3.5). COVID-19 has a very steep age gradient of death risk.⁵¹ It is expected therefore that in locations where the infection finds its way into killing predominantly elderly citizens, the overall, age-unadjusted IFR would be higher. However, IFR would still be very low in people <70 in these locations, e.g. in Gangelt IFR is 0.00% in non-elderly people. Similarly, in Switzerland, 69% of deaths occurred in people >80 years old⁵¹ and this explains the relatively high overall IFR in Geneva and Zurich. Similar to Germany, very few deaths in Switzerland have been recorded in non-elderly people, e.g. only 2.5% have occurred in people <60 years old and IFR in that age-group would be ~0.01%. The majority of deaths in most of the hard hit European countries have happened in nursing homes⁵² and a large proportion of deaths also in the US⁵³ also follow this pattern. Moreover, many nursing home deaths have no laboratory confirmation and thus should be seen with extra caution in terms of the causal impact of SARS-CoV-2.

Locations with high burdens of nursing home deaths may have high IFR estimates, but the IFR would still be very low among non-elderly, non-debilitated people. The average length of stay in a nursing home is slightly more than 2 years and people who die in nursing homes die in a

median of 5 months⁵⁴ so many COVID-19 nursing home deaths may have happened in people with life expectancy of only a few months. This needs to be verified in careful assessments of COVID-19 outbreaks in nursing homes with detailed risk profiling of fatalities. If COVID-19 happened in patients with very limited life expectancy, this pattern may even create a dent of less than expected mortality in the next 3-6 months after the coronavirus excess mortality wave. As of July 12 (week 28), preliminary Euromonitor data⁵⁵ indeed already show a substantial dent below baseline mortality in France, and a dent below baseline mortality is seen also for the aggregate European data.

Within China, the much higher IFR estimates in Wuhan versus other areas may reflect the wide spread of the infection to hospital personnel and the substantial contribution of nosocomial infections to a higher death toll in Wuhan;⁵⁶ plus unfamiliarity with how to deal with the infection in the first location where COVID-19 arose. Massive deaths of elderly individuals in nursing homes, nosocomial infections, and overwhelmed hospitals may also explain the very high fatality in specific locations in Italy⁵⁷ and in New York and neighboring states. Seroprevalence studies in health care workers and administrative hospital staff in Lombardy⁵⁸ found 8% seroprevalence in Milan hospitals and 35-43% in Bergamo hospitals, supporting the scenario for widespread nosocomial infections among vulnerable patients. The high IFR values in New York metropolitan area and neighboring states are also not surprising, given the vast death toll witnessed. A very unfortunate decision of the several state governors was to have COVID-19 patients sent to nursing homes. Moreover, some hospitals in New York City hotspots reached maximum capacity and perhaps could not offer optimal care. Use of unnecessarily aggressive management (e.g. mechanical ventilation) and hydroxychloroquine may also have contributed to worse outcomes. Furthermore, New York City has an extremely busy, congested public transport system that may have exposed large segments of the population to high infectious load in close contact

transmission and, thus, perhaps more severe disease. A more aggressive viral clade has also been speculated, but this needs further verification.⁵⁹

IFR may reach very high levels among disadvantaged populations and settings that have the worst combination of factors predisposing to higher fatalities. Importantly, such hotspot locations are rather uncommon exceptions in the global landscape. Moreover, even in these locations, the IFR for non-elderly individuals without predisposing conditions may remain very low. E.g. in New York City only 0.65% of all deaths happened in people <65 years without major underlying conditions.⁵¹ Thus the IFR even in New York City would probably be lower than 0.01% in these people.

Studies with extremely low inferred IFR are also worthwhile discussing. Possible overestimation of seroprevalence and undercounting of deaths need to be considered. E.g., for Kobe, the authors of the study¹¹ raise the question whether COVID-19 deaths have been undercounted in Japan. Both undercounting and overcounting of COVID-19 deaths may be a caveat in different locations and this is difficult to settle in the absence of very careful scrutiny of medical records and autopsies. The Tokyo data,²⁹ nevertheless, also show similarly very low IFR. Moreover, evaluation of all-cause mortality in Japan has shown no excess deaths during the pandemic, consistent with the possibility that somehow the Japanese population was spared. Very low IFRs seem common in Asian countries, including China (excluding Wuhan), Iran, Israel and India. Former immunity from exposure to other coronaviruses, genetic differences, hygienic etiquette, lower infectious load, and other unknown factors may be speculated. IFR seems to be very low also in Singapore where extensive PCR testing was carried out. As of July 12, 2020, in Singapore there were only 26 deaths among 46,283 cases, suggesting an upper bound of 0.06% for IFR, even if no cases had been missed.

Some surveys have also been designed to assess seroprevalence repeatedly spacing out measurements in the same population over time. A typical pattern that seems to emerge is that seroprevalence may increase several fold within a few weeks, but plateau or even decline may follow.^{10,28} A more prominent decline of seropositivity was seen in a study in Wuhan.³² Genuine decrease may be difficult to differentiate from random variation. However, some preliminary data^{60,61} suggest that decrease in antibody titers may be fast. Decrease in seropositivity over time means that the numbers of infected people may be underestimated and IFR overestimated.

The only data from a low-income country among the 23 studies examined here come from Iran⁸ and India⁴⁹ and the IFR estimates appears to be very low. Iran has a young population with only slightly over 1% of the age pyramid at age >80 and India's population is even younger. Similar considerations apply to almost every less developed country around the world. Given the very sharp age gradient and the sparing of children and young adults from death by COVID-19, one may expect IFR to be fairly low in the less developed countries. However, it remains to be seen whether comorbidities, poverty and frailty (e.g. malnutrition) and congested urban living circumstances may have adverse impact on risk and thus increase IFR also in these countries.

One should caution that the extent of validation of the antibody assays against positive and negative controls differs across studies. Specificity has typically exceeded 99.0%, which is reassuring. However, for very low prevalence rates, even 99% specificity may be problematic. Sensitivity also varies from 60-100% in different validation exercises and for different tests, but typically it is closer to the upper than the lower bound. One caveat about sensitivity is that typically the positive controls are patients who had symptoms and thus were tested and found to be PCR-positive. However, it is possible that symptomatic patients may be more likely to develop antibodies than patients who are asymptomatic or have minimal symptoms and thus had not sought PCR testing.⁶¹⁻⁶⁵ For example, one study found that 40% of asymptomatic patients became

seronegative within 8 weeks.⁶¹ Since the seroprevalence studies specifically try to unearth these asymptomatic/mildly symptomatic missed infections, a lower sensitivity for these mild infections could translate to substantial underestimates of the number of infected people and substantial overestimate of the inferred IFR.

The corrected IFR estimates are trying to account for undercounting of infected people when not all 3 antibodies (IgG, IgM, and IgA) are assessed.⁷ However, the magnitude of the correction is uncertain and may also vary in different circumstances. Moreover, it is possible that an unknown proportion of people may have handled the virus using immune mechanisms (mucosal, innate, cellular) that did not generate any serum antibodies.⁶⁶⁻⁶⁹ This may lead to substantial underestimation of the frequency of infection and respective overestimation of the IFR. One study has found indeed that mild SARS-CoV-2 infections may lead to nasal release of IgA, without serum antibody response.⁶⁸ Another study has found that 6 of 8 interfamilial contacts of index cases remained seronegative despite developing symptoms and 6 of 8 developed persisting T cell responses⁶⁹ and the important role of cellular immune responses even in seronegative patients has been documented also by other investigators.⁷⁰

An interesting observation is that even under congested circumstances, like cruise ships, aircraft carriers or homeless shelter, the proportion of people detected positive typically does not get to exceed 20-45%.^{71,72} Similarly, at a wider population level, values ~47% are the maximum values documented to-date and most values are much lower, yet epidemic waves seem to wane. It has been suggested^{73,74} that differences in host susceptibility and behavior can result in herd immunity at much lower prevalence of infection in the population than originally expected. COVID-19 spreads by infecting certain groups more than others because some people have much higher likelihood of exposure. People most likely to be exposed also tend to be those most likely to spread for the same reasons that put them at high exposure risk. In the absence of random

mixing of people, the epidemic wave may be extinguished even with relatively low proportions of people becoming infected. Seasonality may also play a role in the dissipation of the epidemic wave. It has also been observed that many people have CD4 cellular responses to SARS-CoV-2 even without being exposed to this virus, perhaps due to prior exposure to other coronaviruses.⁷⁵ It is unknown whether this proportion varies in different populations around the world and whether this immunity may contribute to SARS-CoV-2 epidemic waves waning without infecting a large share of the population.

A major limitation of the current analysis is that the calculations presented in this paper include several studies that have not yet been fully peer-reviewed. Moreover, there are several studies that are still ongoing. New emerging data may offer more insights and updated estimates. Given that the large majority of studies have been done in locations that were hard hit from COVID-19, it would be useful to do more studies in less hit locations, so as to have a more balanced global perspective.

A comparison of COVID-19 to influenza is often attempted, but many are confused by this comparison unless placed in context. Based on the IFR estimates obtained here, COVID-19 may have infected as of July 12 approximately 300 million people (or more), far more than the ~13 million PCR-documented cases. The global COVID-19 death toll is still evolving, but it is still not much dissimilar to a typical death toll from seasonal influenza (290,000-650,000),⁷⁶ while “bad” influenza years (e.g. 1957-9 and 1968-70) have been associated with 1-4 million deaths.⁷⁷ Notably, influenza devastates low-income countries, but is more tolerant of wealthy nations, probably because of the availability and wider use of vaccination in these countries.⁵⁸ Conversely, in the absence of vaccine and with a clear preference for elderly debilitated individuals, COVID-19 may have an inverse death toll profile, with more deaths in wealthy nations than in low-income countries. However, even in the wealthy nations, COVID-19 seems to affect predominantly the

frail, the disadvantaged, and the marginalized – as shown by high rates of infectious burden in nursing homes, homeless shelters, prisons, meat processing plants, and the strong racial/ethnic inequalities against minorities in terms of the cumulative death risk.^{78,79}

While COVID-19 is a formidable threat, the fact that its IFR is typically much lower than originally feared, is a welcome piece of evidence. The median IFR found in this analysis is very similar to the estimate recently adopted by CDC for planning purposes.⁸⁰ The fact that IFR can vary substantially also based on case-mix and settings involved also creates additional ground for evidence-based, more precise management strategies. Decision-makers can use measures that will try to avert having this lethal virus infect people and settings who are at high risk of severe outcomes. These measures may be possible to be more precise and tailored to specific high-risk individuals and settings than blind lockdown of the entire society. Of course, uncertainty remains about the future evolution of the pandemic, e.g. the presence and height of subsequent waves.⁸¹ However, it is helpful to know that SARS-CoV-2 has relatively modest IFR overall and that possibly IFR can be made even lower with appropriate, precise non-pharmacological choices.

Table 1. Seroprevalence studies on COVID-19 published or depositing preprints as of July 11, 2020: dates, sampling and recruitment process

Location	Dates	Sampling and recruitment
Iran (Guilan) ⁸	April (until April 21)	Population-based cluster random sampling design through phone call invitation, household-based.
Idaho (Boise) ⁹	Late April	People from the Boise, Idaho metropolitan area, part of the Crush the Curve initiative.
Switzerland (Geneva) ¹⁰	April 6-May 9 (5 consecutive weeks)	Randomly selected previous participants of the Bus Santé study with an email (or phone contact, if e-mail unavailable); participants were invited to bring all members of their household, aged 5 years and older.
Japan (Kobe) ¹¹	March 31-April 7	Randomly selected patients who visited outpatient clinics and received blood testing for any reason. Patients who visited the emergency department or the designated fever consultation service were excluded.
Denmark blood donors ¹²	April 6-May 3	All Danish blood donors aged 17-69 years giving blood. Blood donors are healthy and must comply with strict eligibility criteria; they must self-defer for two weeks if they develop fever with upper respiratory symptoms.
France (Oise) ¹³	March 30-April 4	Pupils, their parents and siblings, as well as teachers and non-teaching staff of a high-school.

China (Wuhan) ¹⁴	April 3-15	People applying for a permission of resume (n=1,021) and hospitalized patients during April 3 to 15 (n=381).
Netherlands blood donors ¹⁵	April 1-15	Blood donors. Donors must be completely healthy, but they may have been ill in the past, provided that they recovered at least two weeks before.
Germany (Gangelt) ¹⁶	March 30-April 6	600 adult persons with different surnames in Gangelt were randomly selected, and all household members were asked to participate in the study.
Brazil (Rio Grande do Sul) ¹⁷	May 9-11 (third round, after April 11-13, and 25-27)	Multi-stage probability sampling was used in each of 9 cities to select 500 households, within which one resident was randomly chosen for testing.
Scotland blood donors ¹⁸	March 21-23	Blood donors. Donors should not have felt unwell in the last 14 days, also some other deferrals applied regarding travel and COVID-19 symptoms.
California (Santa Clara) ¹⁹	April 2-3	Facebook ad with additional targeting by zip code.
Luxembourg ²⁰	April 16-May 5	Representative sample (no details how ensured), 1807 of 2000 contacted provided data, were <79 years and had serology results.

Germany (Frankfurt) ²¹	April 6-14	Employees of Infraserb Höchst, a large industrial site operator in Frankfurt am Main. No exclusion criteria.
California (Los Angeles) ²²	April 10-14	Proprietary database representative of the county. A random sample of these residents was invited, with quotas for enrollment for subgroups based on age, sex, race, and ethnicity distribution.
New York ²³	April 19-28	Convenience sample of patrons ≥18 years and residing in New York State, recruited consecutively upon entering 99 grocery stores and via an in-store flyer.
California (Bay Area) ²⁴	March	1,000 blood donors in diverse Bay Area locations (excluding those with self-reported symptoms or abnormal vital signs)
Brazil ²⁵	May 15-22	Sampling from 133 cities (the main city in each region), selecting 25 census tracts with probability proportionate to size in each sentinel city, and 10 households at random in each tract. Aiming for 250 participants per city.
Croatia ²⁶	April 23-28	DIV factory workers in Split and Sibenik-Knin invited for voluntary testing
New York (Brooklyn) ²⁷	Early May	Patients seen in urgent care facility in Brooklyn
Switzerland (Zurich) ²⁸	Prepandemic until June (patients)	Patients at the University Hospital of Zurich and blood donors in Zurich and Lucerne

	and May (blood donors)	
Japan (Tokyo) ²⁹	April 21-May 20	Two community clinics located in the major railway stations in Tokyo (Navitas Clinic Shinjuku and Tachikawa)
Spain (Barcelona) ³⁰	April 14-May 5	Consecutive pregnant women for first trimester screening or delivery in two hospitals
Italy (Apulia) blood donors ³¹	May 1-May 31	Blood donors 18-65 years old free of recent symptoms possibly related to COVID-19, no close contact with confirmed cases, symptoms free during the preceding 14 days, no contacts with suspected cases
China (Wuhan B) ³²	March 26-April 28	Age 16-64, going back to work, with no fever, headache, or other symptoms of COVID-19
California (San Francisco) ³³	April 25-April 28 (and n=40 in May)	U.S. census tract 022901 population-dense area (58% Latinx) in San Francisco Mission district, expanded to neighboring blocks on April 28
Brazil (Espírito Santo) ³⁴	May 13-15	Cross-sectional of major municipalities structured over houses as the sampling units
USA (six states) ³⁵	March 23-April 1 (WA Puget Sound and NYC), April 6-10 (south Florida), April 20-	Convenience samples using residual sera obtained for routine clinical testing (screening or management) by two commercial laboratory companies

	26 (MO), April	
	20-May 3 (UT),	
	April 26-May 3	
	(CT)	
Spain ³⁶	April 27-May 11	35883 households selected from municipal rolls using two-stage random sampling stratified by province and municipality size, with all residents invited to participate (75.1% of all contacted individuals participated)
Louisiana (Orleans and Jefferson Parish) ³⁷	May 9-15	Pool of potential participants reflective of the demographics of the Parishes was based on 50 characteristics, then a randomized subset of 150,000 was selected, then 25,000 were approached with digital aps, and 2640 recruited.
Belgium ³⁸	March 30-April 5 and April 20-26	Residual sera from ten private diagnostic laboratories in Belgium, with fixed numbers per age group, region and periodical sampling, and stratified by sex
France (Crepv-en-Valois) ³⁹	April 28-30	Pupils, their parents and relatives, and staff of primary schools exposed to SARS-CoV-2 in February and March 2020 in a city north of Paris
China (several regions) ^{40*}	March 30-April 10	Voluntary participation by public call for hemodialysis patients (n=979 in Zingzhou, Ubei and n=563 in Guangzhou/Foshun, Guangdong)

		and outpatients in Chingqing (n=993), and community residents in Chengdu, Sichuan (n=9442), and required testing for factory workers in Guangzhou, Guandong (n=442)
Brazil (Rio de Janeiro) blood donors ⁴¹	April 14-27 (eligible: April 24-27)	Blood donors could not have had flulike symptoms within the 30 days before donation; had close contact with suspected or confirmed covid-19 cases in the 30 days before donation; or traveled abroad in the past 30 days.
Brazil (Sao Paulo) ⁴²	May 4-12	Randomly selected adults and their cohabitants sampled from 6 districts of Sao Paulo City with high number of cases
Chile (Vitacura) ⁴³	May 4-19	Classroom stratified sample of children and all staff in a community placed on quarantine after school outbreak

Two of the studies included additional datasets of <500 participants that are not presented here (n=200 blood donors in Oise and n=387 patients in the California (Bay Area) study)
*not considered here are some sub-cohorts from this study, including healthcare workers, and staff from hotel for healthcare workers

Table 2. Sample size, types of antibodies, and population in relevant region

Location	Sample size	Antibody	Population in region*	Population <70 years (%)
Iran (Guilan) ⁸	551	IgG/IgM	2354848	95
Idaho (Boise) ⁹	4856	IgG	481587 (Ada county)	92
Switzerland (Geneva) ¹⁰	577 (4/20-27)	IgG	500000	88
Japan (Kobe) ¹¹	1000	IgG	1518870	79 (Japan)
Denmark blood donors ¹²	20640	IgG/IgM	5771876	86
France (Oise) ¹³	661	IgG	5978000 (Hauts-de-France)	89
China (Wuhan) ¹⁴	1401	IgG/IgM	11080000	93 (China)
Netherlands blood donors ¹⁵	7361	IgG/IgM/IgA	17097123	86
Germany (Gangelt) ¹⁶	919	IgG/IgA	12597	86
Brazil (Rio Grande do Sul) ¹⁷	4500	IgG	11377239	91
Scotland blood donors ¹⁸	500	IgG	5400000	88
California (Santa Clara) ¹⁹	3300	IgG/IgM	1928000	90
Luxembourg ²⁰	1807	IgG/IgA**	615729	90
Germany (Frankfurt) ²¹	1000	IgG	2681000***	84 (Germany)
California (Los Angeles) ²²	863	IgG/IgM	7892000	92
New York ²³	15101	IgG	19450000	90
California (Bay Area) ²⁴	1000	IgG	7753000	90
Brazil (133 cities) ²⁵	24995	IgG/IgM	74656499	94 (Brazil)

Croatia ²⁶	1494	IgG/IgM	4076000	86
New York (Brooklyn) ²⁷	11092	IgG	2559903	91
Switzerland (Zurich) ²⁸	1644 patients (4/1-15)	IgG	1520968 (canton Zurich) 1930525 (Zurich+Lucerne)	88
	1640 blood donors (May)			
Japan (Tokyo) ²⁹	1071	IgG	13902077	79 (Japan)
Spain (Barcelona) ³⁰	874	IgG/IgM/IgA	7566000 (Catalonia)	86
Italy (Apulia) blood donors ³¹	909	IgG/IgM	4029000	84
China (Wuhan B) ³²	1196 (4/4-8)	IgG/IgM	11080000	93 (China)
California (San Francisco) ³³	3953	IgG (also PCR testing)	5174 (census 022901)	95
Brazil (Espirito Santo) ³⁴	4608	IgG/IgM	4018650	94 (Brazil)
USA (six states) ³⁵		Pan-Ig		
WA Puget Sound	3264		4273548	90 (WA)
UT	1132		3282120	92
NYC	2482		9260870	89
MO	1882		6110800	88
South FL	1742		6345345	86 (FL)
CT	1431		3562989	88
Spain ³⁶	61075	IgG	46940000	85
Louisiana (Orleans and Jefferson Parish) ³⁷	2640	IgG	825057	92 (LA)

Belgium ³⁸	3391 (4/20-26)	IgG	11589623	86
France (Crepy-en-Valois) ³⁹	1340	IgG	5978000 (Hauts-de-France)	89
China (several regions) ⁴⁰		IgG/IgM		
Hubei (not Wuhan)	979		48058000	93 (China)
Chongqing	993		31243200	93 (China)
Sichuan	9442		83750000	93 (China)
Guangdong	1005		115210000	93 (China)
Brazil (Rio de Janeiro)	669 (4/24-27)	IgG/IgM	17264943	94 (Brazil)
blood donors ⁴¹				
Brazil (Sao Paulo) ⁴²	517	IgG/IgM	298240 (6 districts)	94 (Brazil)
Chile (Vitacura) ⁴³	1244	IgG/IgM	85000	92 (Chile)

*The authors of some studies preferred to focus on age-restricted populations: 17-70 years old in the Denmark blood donor study (n=3800000), those 18-79 years old in the Luxembourg study (n=483000); those <70 years old in Netherlands blood donor study (n=13745768); those ≥18 years old in the New York state study (n=15280000); and those >19 years old in the UT population of the six states US study (n=2173082).

**considered positive if both IgG and IgA were positive

***participants were recruited from a large number of districts, but most districts had very few participants; here the population of the 9 districts with >1:10,000 sampling ratio is included (846/1000 participants came from these 9 districts).

Table 3. Prevalence of infection and estimated number of infected people

Location	Seroprevalence (%)		Estimated infected
	Crude	Adjusted (adjustments)	
Iran (Guilan) ⁸	22.0	33.0 (test, sampling)	770000
Idaho (Boise) ⁹	1.79	ND	8620
Switzerland (Geneva) ¹⁰	10.6	10.9 (test, age, sex)	54500
Japan (Kobe) ¹¹	3.3	2.7 (age, sex)	40999
Denmark blood donors ¹²	2.0	1.9 (test)	109665
France (Oise) ¹³	25.9	ND	1548000
China (Wuhan) ¹⁴	10.0	ND	1108000
Netherlands blood donors ¹⁵	2.7	ND	461622
Germany (Gangelt) ¹⁶	15.0	20.0 (test, cluster, sym)	2519
Brazil (Rio Grande do Sul) ¹⁷	0.222	0.222 (sampling)*	25283
Scotland blood donors ¹⁸	1.2	ND	64800
California (Santa Clara) ¹⁹	1.5	2.6 (test, sampling, cluster)	51000
Luxembourg ²⁰	1.9	2.06 (age, sex, district)	12684
Germany (Frankfurt) ²¹	0.6	ND	16086
California (Los Angeles) ²²	4.06	4.65 (test, sex, race/ethnicity, income)	367000
New York ²³	12.5	14.0 (test, sex, age, race/ethnicity, region)	2723000
California (Bay Area) ²⁴	0.4 (blood donors)	0.1 (test/confirmation)	7753

Brazil (133 cities) ²⁵	1.39	1.62 overall, varying from 0 to 25.0 across 133 cities (test, design)	1209435**
Croatia ²⁶	1.27***	ND	51765
New York (Brooklyn) ²⁷	47.0	ND	1203154
Switzerland (Zurich) ²⁸	unclear	1.3 in patients in April 1-15 and 1.6 in blood donors in May (multivariate Gaussian conditioning)	19773 (Zurich) 30888 (Zurich+Lucerne)
Japan (Tokyo) ²⁹	3.83	ND	532450
Spain (Barcelona) ³⁰	14.3	ND	1081938
Italy (Apulia) blood donors ³¹	0.99	ND	39887
China (Wuhan B) ³²	8.36 (3.53 for entire period)	ND (2.80 (age, gender, test) for entire period)	926288
California (San Francisco) ³³	4.3 in the census track	6.1 (age, sex, race/ethnicity, test)	316
Brazil (Espirito Santo) ³⁴	2.1	ND	84391
USA (six states) ³⁵		(age, sex, test)	
WA Puget Sound	1.3	1.13	48291
UT	2.4	2.18	71550
NYC	5.7	6.93	641778
MO	2.9	2.65	161936

South FL	2.2	1.85	117389
CT	4.9	4.94	176012
Spain ³⁶	ND	5.0**** (sampling, age, sex, income)	2347000
Louisiana (Orleans and Jefferson Parish) ³⁷	6.9 (IgG or PCR)	6.9 for IgG (census weighting, demographics)	56578
Belgium ³⁸	5.7	6.0 (sampling, age, sex, province)	695377
France (Crepy-en-Valois) ³⁹	10.4	ND	620105
China (several regions) ⁴⁰			
Hubei (not Wuhan)	3.6	ND	1718110
Chongqing	3.8	ND	11956109
Sichuan	0.6	ND	487847
Guangdong	2.2	ND	2522010
Brazil (Rio de Janeiro) blood donors ⁴¹	6.0	4.7 (age, sex, test)	811452
Brazil (Sao Paulo) ⁴²	5.2	4.7 (sampling design)	14017
Chile (Vitacura) ⁴³	11.2	ND	9500

Among studies with multiple consecutive time points where seroprevalence was evaluated, the seroprevalence estimate was the highest in the most recent time interval with the exception of Switzerland (Geneva) where the highest value was seen two weeks before the last time interval, Switzerland (Zurich) where the highest was seen in April 1-15 for patients at the university hospital and in May for blood donors, and the China (Wuhan B) study where the highest value was seen about 3 weeks before the last time interval.

*an estimate is also provided adjusting for test performance, but the assumed specificity of 99.0% seems inappropriate, since as part of the validation process the authors also found that several of the test-positive individuals had household members who were also infected, thus the estimated specificity was deemed to be at least 99.95%

**the authors calculate 760000 infected in the 90 cities that had 200-250 samples tested, but many of the other 43 cities with <200 samples may be equally or even better represented, since they tended to be smaller than the 90 (mean population 356213 versus 659326)

***1.20% in workers in Split without mobility restrictions, 3.37% in workers in Knin without mobility restrictions, 1.57% for all workers without mobility restrictions; Split and Knin tended to have somewhat higher death rates than nation-wide Croatia, but residence of workers is not given, so the entire population of the country is used in the calculations

**** 5.0% by point of care test, 4.6% with immunoassay, 3.7% by having both tests positive, 6.2% by having at least one test positive

test: test performance; ND: no data available

Table 4. Inferred infection fatality rates

Location	COVID-19 deaths (date)	Inferred IFR (corrected), %	COVID-19 deaths <70 years,*** %	IFR in <70 years (corrected), %
Iran (Guilan) ⁸	617 (4/23)	0.08 (0.07)	No data	No data
Idaho (Boise) ⁹	14 (4/24)	0.16 (0.13)	14 (Idaho)	0.02 (0.02)
Switzerland (Geneva) ¹⁰	243 (4/30)	0.45 (0.36)	8	0.04 (0.03)
Japan (Kobe) ¹¹	10 (mid-April)	0.02 (0.02)	21 (Japan)	0.01 (0.01)
Denmark blood donors ¹²	370 (4/21)	0.34 (0.27)	12	0.05 (0.04)
France (Oise) ¹³	932 (4/7)#	0.06 (0.05)	7 (France, <65 years)	0.01 (0.01)
China (Wuhan) ¹⁴	3869 (5/2)	0.35 (0.31)	50	0.19 (0.15)
Netherlands blood donors ¹⁵	3134 (4/15)	0.68 (0.68)	11	0.09 (0.09)
Germany (Gangelt) ¹⁶	7 (4/15)	0.28 (0.25)	0	0.00 (0.00)
Brazil (Rio Grande do Sul) ¹⁷	124 (5/14)	0.49 (0.39)	31 (Brazil, <60 years)	0.19 (0.15)
Scotland blood donors ¹⁸	47 (4/1)	0.07 (0.06)	9 (<65 years)	0.01 (0.01)
California (Santa Clara) ¹⁹	94 (4/22)	0.18 (0.17)	35	0.07 (0.06)
Luxembourg ²⁰	92 (5/2)	0.73 (0.58)	9	0.07 (0.06)
Germany (Frankfurt) ²¹	42*(4/17)	0.26 (0.21)	14 (Germany)	0.04 (0.03)
California (Los Angeles) ²²	724 (4/19)	0.20 (0.18)	24 (<65 years)	0.06 (0.05)
New York ²³	18610 (4/30)^	0.68 (0.54)^	34	0.26 (0.23)^

California (Bay Area) ²⁴	12 (3/22)	0.15 (0.12)	25	0.04 (0.03)
Brazil (133 cities) ²⁵	**	Median 0.30 (0.27)	31 (<60 years)	0.10 (0.9)
Croatia ²⁶	79 (5/3)	0.15 (0.14)	13	0.02 (0.02)
New York (Brooklyn) ²⁷	4894 (5/19)^	0.41 (0.33)^	34 (NY State)	0.15 (0.14)^
Switzerland (Zurich) ²⁸	107 (4/15 Zurich), 147 (5/22, Zurich+Lucerne)	0.51 (0.41)	8 (Switzerland)	0.05 (0.04)
Japan (Tokyo) ²⁹	189 (5/11)	0.04 (0.03)	21 (Japan)	0.01 (0.01)
Spain (Barcelona) ³⁰	5137 (5/2)	0.48 (0.48)	13 (Spain)	0.07 (0.07)
Italy (Apulia) blood donors ³¹	530 (5/22)	1.33 (1.20)	15 (Italy)	0.24 (0.22)
China (Wuhan B) ³²	3869 (4/13)	0.42 (0.38)	50	0.23 (0.21)
California (San Francisco) ³³	0 (5/4)	0.00 (0.00)	0	0.00 (0.00)
Brazil (Espirito Santo) ³⁴	363 (5/21)	0.43 (0.39)	31 (Brazil, <60 years)	0.14 (0.13)
USA (six states) ³⁵				
WA Puget Sound	207 (4/4)	0.43 (0.43)	10 (WA, <60)	0.05 (0.05)
UT	58 (5/4)	0.08 (0.08)	28 (<65)	0.03 (0.03)
NYC	4146 (4/4)	0.65 (0.65)	34 (NY state)	0.25 (0.25)
MO	329 (4/30)	0.20 (0.20)	23	0.05 (0.05)
South FL	295 (4/15)	0.25 (0.25)	28 (FL)	0.08 (0.08)
CT	2718 (5/6)	1.54 (1.54)	18	0.31 (0.31)

Spain ³⁶	26920 (5/11)	1.15 (0.92)	13	0.18 (0.14)
Louisiana ³⁷	925 (5/16)	1.63 (1.31)	32	0.57 (0.46)
Belgium ³⁸	7594 (4/30)	1.09 (0.87)	10	0.13 (0.10)
France (Crepy-en-Valois) ³⁹	2325 (5/5)#	0.37 (0.30)	7 (France, <65 years)	0.04 (0.03)
China (several regions) ⁴⁰				
Hubei (not Wuhan)	643 (4/12)	0.04 (0.03)	About 50? (if	0.02 (0.02)
Chongqing	6 (4/12)	0.00 (0.00)	similar to	0.00 (0.00)
Sichuan	3 (4/12)	0.00 (0.00)	Wuhan)	0.00 (0.00)
Guangdong	8 (4/12)	0.00 (0.00)		0.00 (0.00)
Brazil (Rio de Janeiro) blood donors ⁴¹	1019 (5/3)	0.12 (0.11)	31 (Brazil, <60 years)	0.04 (0.04)
Brazil (Sao Paulo) ^{42****}	Unknown (5/15)	Unknown, but likely >0.4	31 (Brazil, <60 years)	Unknown, but likely >0.1
Chile (Vitacura) ^{43****}	Unknown (5/18)	Unknown, but likely <0.2	36 (Chile)	Unknown, but likely <0.1

*approximated from number of deaths in the Hesse province on 4/17 times the proportion of deaths in the 9 districts with key enrollment in the study among all Hesse province deaths.

**data are provided by the authors for deaths per 100,000 population in each city along with inferred IFR in each city, with wide differences across cities; the IFR shown here is the median across the 36 cities with 200-250 samples and at least one positive sample (the interquartile range for the uncorrected IFR is 0.20-0.60 and the full range across all cities is 0-2.4%, but with very wide uncertainty in each city). A higher IFR is alluded in the preprint, but the preprint also shows a scatter diagram for survey-based seroprevalence versus reported deaths per population with a regression slope that agrees with IFR of 0.3.

*** whenever the number/proportion of COVID-19 deaths at age <70 years was not provided in the paper, the proportion of these deaths was retrieved from situational reports of the relevant location; when this was not possible to find for the specific location, a larger geographic entity was used. For Brazil, the closest information that could be found was from a news report

(<https://www.thejakartapost.com/news/2020/05/22/in-brazil-covid-19-hitting-young-people-harder.html>).

For Croatia, data on age for 45/103 deaths were retrieved through Wikipedia.

**** Information on deaths not available for the specific locations. In the Sao Paulo study, the 6 districts were selected as being the most hit of Sao Paulo, but it is not stated which are the districts and one cannot

retrieve what the number of deaths was as of mid-May, but even using data for death rates across all Sao Paulo would lead to IFR >0.4 overall. In the Vitacura study, similarly one can infer from the wider Santiago Metropolitan area that in the Vitacura area the IFR would probably be <0.2 overall.

^Confirmed deaths; inclusion of probable deaths would increase the IFR estimates by about a quarter.

#for France, governmental situational reports provide per region the number of deaths only for in-hospital deaths, therefore the number of in-hospital deaths has been multiplied by a factor equal to the total deaths/in-hospital deaths across France.

IFR: infection fatality rate. The inferred IFR is derived by dividing the number of accumulated deaths (at the time chosen by the authors of each study, or until after 1 week of the mid-point of the study dates, whenever the authors had not arbitrated on a date for the death count) by the estimated number of infected people. The corrected IFR is obtained from the inferred IFR assuming that, as compared with assessing IgG, IgM, and IgA, 20% of the infections are missed when only IgG is assessed, and 10% of the infections are missed when two of the three antibodies are assessed.

Table 5. Additional seroprevalence data from nation-wide studies that have been announced to the press and/or in preliminary reports, but are not presented yet as full articles. Only countries not represented in Tables 1-4 are considered.

Country	Sample size (antibody)	Date	Seroprevalence (%)	Population	Deaths (date)	IFR (corrected)
United Kingdom ⁴⁴	885 (IgG)	April 26-May 24 [^]	6.78	67897000	34636 (5/17)	0.75 (0.60)
Finland ⁴⁵	674 (IgG)	April 20-26 [^]	2.52	5541000	211 (4/30)	0.15 (0.12)
Sweden ⁴⁶	1200 (IgG)	May 18-24	6.3	10101000	4501 (5/28)	0.71 (0.57)
Czechia ⁴⁷	26549 (IgG)	April 23-May 1	0.40	10710000	252 (5/4)	0.59 (0.47)
Israel ⁴⁸	1709 (IgG?)	May 2020	2-3	9198000	299 (6/10)	0.13 (0.10)*
India ⁴⁹	26400 (IgG?)	May 2020	0.73**	1380382000	8107 (6/10)	0.08 (0.06)
Slovenia ⁵⁰	1368 (IgG?)	April 2020	3.1	2079000	92 (5/1)	0.14 (0.11)

[^] slightly lower seroprevalence recorded in subsequent weeks

*Assuming seroprevalence 2.5%. Another ongoing study in Beni Brak (population n=198900, 0 deaths as of mid-June) has shown seroprevalence of 1.4% among the first 2933 samples. A much larger seroprevalence study based on HMOs has also been launched.

**based on data from part of the sample (65 of the 83 districts)

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Figure legends

Figure 1. Locations that had two or more IFR estimates from different studies. Locations are defined at the level of countries, except for the USA where they are defined at the level of states and China is separated into Wuhan and non-Wuhan areas. Corrected IFR estimates are shown. Within the same location, IFR estimates tend to have only modest differences, even though it is possible that different areas within the same location may also have genuinely different IFR. France is one exception where differences are large, but both estimates come from population studies of outbreaks from schools and thus may not provide good estimates of population seroprevalence and may lead to underestimated IFR.

Figure 2. Scatterplot of corrected IFR estimates (%) in each location plotted against the COVID-19 mortality rate as of July 12, 2020 in that location (in deaths per million population). Locations are defined at the level of countries, except for the USA where they are defined at the level of states and China is separated into Wuhan and non-Wuhan areas. When several IFR estimates are available from multiple studies for a location, the sample size-weighted mean has been used. Not shown are two locations with >1000 deaths per million population, both of which have high IFR (New York and Connecticut).

Figure 1

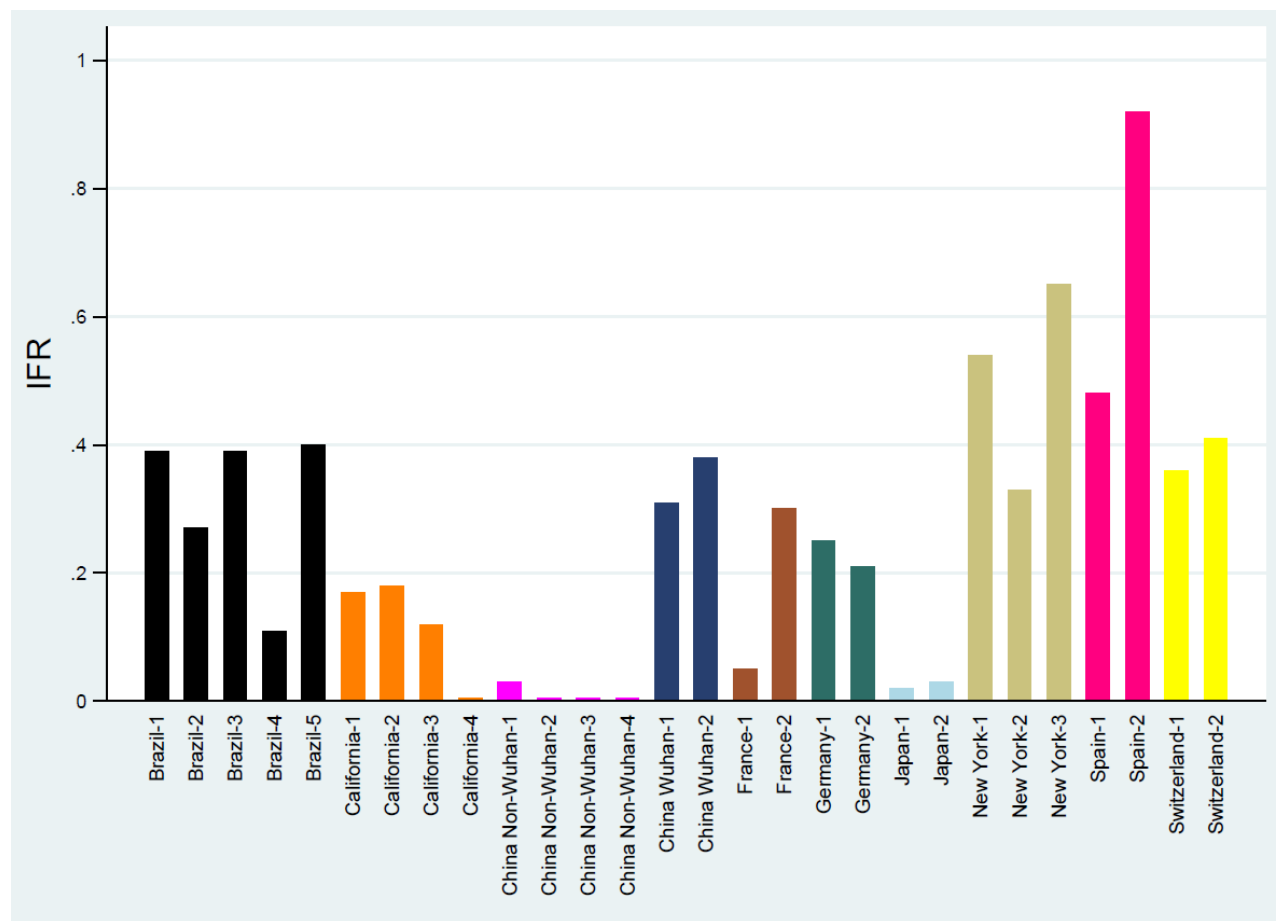


Figure 2

